NETWORK WORLD
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The Short List debuts
Page 101

MCI knocks down cost of local access

By Bob Wallace
Senior Editor

WASHINGTON, D.C. — Upstaging AT&T, MCI Communications Corp. last week offered customers big discounts on local access in exchange for long-term service contracts, a shift that should result in substantial cost savings for users.

Under MCI's Access Pricing Plan, users that sign one- to three-year contracts can save as much as 20% on dedicated access, which can account for as much as half the price of an end-to-end private line.

The plan is more ambitious than AT&T's Access Multi-Service Volume Pricing Plan (AMSVPP), which was introduced last August ("AT&T floats plan for private-line overhaul," *NW,* Aug. 10, 1992). That plan offers discounts of as much as 10%.

Both carriers attribute the ability to discount access provided by local carriers — the cost of which is typically just passed through to the customer — to advances in the way they manage their access infrastructure.

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PHOTO ©1993 BILL O'CONNELL

Focus Software, Inc.'s test team runs E-mail messaging drills.

E-mail test sends message of interoperability woes

By Jim Brown
and Stephen Mattin
Special to Network World

As departmental local-area networks coalesce into enterprise internets, network managers are left with the daunting task of integrating disparate electronic mail packages.

And what a task it is. The first of our Network Software Tests, conducted by Focus Software, Inc., discovered that while it is always possible to send short, simple text messages between leading E-mail products running on similar and dissimilar workstations, users often lose many simple features, such as sending a receipt when a message is received.

In addition, testing revealed that users are likely to encounter problems when they use E-mail to transfer files, due largely to different file encoding methods and the lack of a standard E-mail envelope that describes the file attachments.

The test put eight E-mail clients from five different vendors through the paces. The test team

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StrataCom to stake claim in ATM frontier

Mux maker to share stage with AT&T and Cisco in rollout of ATM switch for public, private networks.

By Jim Duffy
and Maureen Molloy
Network World Staff

NEW YORK — StrataCom, Inc. is expected to muscle its way into the broadband networking arena this week with the introduction of an Asynchronous Transfer Mode (ATM) switch for public and private networks.

StrataCom's Broadband-PX (BPX) switch will be based on a switching matrix with a capacity of up to 9.6G bit/sec and will support wide-area links of up to 620M bit/sec. The initial version will support a T-3 interface card, while later versions will offer 2M bit/sec frame relay, Switched Multimegabit Data Service (SMDS), ATM, Fiber Distributed Data Interface and Synchronous Optical Network (SONET) interfaces, sources said.

AT&T and Cisco Systems, Inc. will be on hand to show their support for StrataCom, with Cisco expected to unveil an ATM interface board that will link its routers at T-3 speeds to other ATM devices, including the BPX, via a High Speed Serial Interface.

Cisco's interface is the first fruit of the ATM strategy it announced in November. Cisco's support for the BPX builds on its relationship with StrataCom. The two companies undertook work

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INSIDE

Buyer's Guide examines the gamut of issues to consider for software distribution tools. Page 98.

Oracle V.7 a problem for VINES users

By Timothy O'Brien
West Coast Bureau Chief

NEWARK, Del. — It was only a year ago that Delmarva Power and Light Co. selected Oracle Corp.'s Version 6 database to run on Banyan Systems, Inc. VINES servers across the company.

But now Delmarva is being told by both vendors it has to upgrade its servers to The Santa Cruz Operation, Inc.'s SCO Unix if it wants to use the new, highly touted Version 7 of the Oracle database. Banyan recently decided to discontinue development of its proprietary Unix in favor of SCO Unix as the server platform for VINES.

That's a big problem — not only for Delmarva, but for any user running Oracle on Banyan's proprietary Unix-based VINES. John Scoggin, supervisor of network operations at Delmarva, contacted the Reader Advocacy Force (R.A.F.) Forum on *Network World's* Bulletin Board System (BBS) to bring the situa-

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NETLINE

CHIPCOM INCREASES port capacity of its hubs. Page 4.

APPLE TO ENHANCE router to extend AppleTalk over TCP/IP links. Page 4.

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MICROSOFT PLUCKS Apple guru to head division. Page 6.

INTERNET RESOURCES to appear in new database under NSF contract. Page 6.

LAN WORLD

See LAN World, following page 22.

NEWSPAPER

To users' dismay, carriers mum on ATM service plans

By Skip MacAskill
and Bob Wallace
Network World Staff

Forward-thinking users are trying to determine the role Asynchronous Transfer Mode (ATM) will play in the future of their networks, but strategic planning is being slowed by local and long-distance carriers that have yet to share their plans for ATM services.

NETWORK WORLD'S R.A.F. READER ADVOCACY FORCE

Until it's clear how carriers plan to support ATM in their networks, what ATM-based services they envision and how they intend to price such services, users cannot determine whether ATM makes sense as a way to support emerging high-bandwidth applications across an enterprise.

Many hub, router and switch vendors have already laid out their ATM blueprints. But to date, only Sprint Corp. and Nynex Corp. have discussed plans to offer ATM service, and neither has divulged pricing.

The six other regional Bell holding companies, as well as AT&T and MCI Communications Corp., have not publicly

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Wellfleet preps OSI router, high-speed HSSI interface

Router offers full set of OSI routing protocols; interface supports frame relay links, SMDS, ATM.

By Ellen Messmer
and Maureen Molloy
Network World Staff

WASHINGTON, D.C. — By the end of this month, Wellfleet Communications, Inc. will ship a router implementing all the Open Systems Interconnection routing protocols, the company told *Network World* last week.

The vendor also announced a High Speed Serial Interface (HSSI) for its line of existing routers that will support wide-area network circuits at speeds up to 52M bit/sec.

The Wellfleet OSI router will include support for the Connectionless Network Service, the Connectionless Network Protocol (CLNP), End System to Intermediate System (ES-IS) and the Intermediate System to Intermediate System (IS-IS) protocols. The added support will give Wellfleet entry into the federal market where purchase of OSI products has now become a requirement.

Deciding to wait

Greg Fowler, Wellfleet federal marketing engineer, last week said that the company had held off on introducing OSI support for its multiprotocol routers until it was able to give users the full set of OSI routing protocols — the core network layer, CLNP, and the two routing protocols, ES-IS and IS-IS — all at one time.

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Novell, AT&T ink datacom, telecom integration pact

To develop products to integrate PBXs, NetWare.

By Caryn Gillooly
Senior Editor

PROVO, Utah — Novell, Inc. and AT&T last week announced an agreement to jointly develop and market products that could ultimately bring down the longstanding wall between computer and telephone networks.

The products, collectively called Telephony Services for NetWare, will provide a way to integrate customers' private branch exchange systems into their NetWare local-area networks to give desktop computers control over PBX calling functions.

Telephony Services for NetWare will initially consist of the Telephony Server NetWare Loadable Module (NLM) and AT&T's PassageWay. The NLM will link NetWare 3.X or 4.X users with AT&T's Definity Communications System PBX. PassageWay is a desktop application that will let users speed-dial and take notes associated with individual phone calls.

Secret to its success

The technology's success, however, seems to depend on third parties developing applications based on a suite of application program interfaces (API) Novell and AT&T will codevelop.

Vendors using the APIs could develop applications, for example, to integrate electronic mail, autodialing and conference calling with one another. That would

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AT&T buys into Canadian carrier in face-off with MCI

By Bob Brown
Senior Editor

TORONTO — AT&T escalated its war with MCI Communications Corp. north of the border last week by announcing plans to buy 20% of Canadian long-haul carrier Unitel Communications, Inc. for about $117 million.

AT&T's move counters MCI's recent agreement with Stentor, a long-haul service consortium involving nine Canadian carriers, including Bell Canada. MCI's plan to lease its network software to Stentor and implement a common transborder network has led AT&T to charge its largest U.S. rival with patent infringement. MCI is countersuing.

Ironically, underdog MCI has

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Briefs

HP to flesh out 100M bit/sec Ethernet . . . Hewlett-Packard Co. is expected to further outline at this week's NetWorld 93 Boston show its scheme for running Ethernet at 100M bit/sec. Because the technology, called 100BaseVG, utilizes the same packet size as and similar signaling to traditional Ethernet, HP plans to offer workstation adapter cards that support both 100M and 10M bit/sec speeds.

... and delay window opening. HP is now looking at a second quarter ship date for OpenView for Windows 7.0, the next iteration of its Transmission Control Protocol/Internet Protocol network management system, which runs on Windows workstations. Version 7.0, originally planned for first-quarter shipment, will be able to simultaneously display multiple network maps and let users drag and drop devices from one map to another.

Lexcel pierces Lance+. Lexcel, a division of Micro Technology, Inc., last week announced it is halting development of its Lance+ network management software package in order to refocus its efforts on the network systems storage market. Production of the Simple Network Management Protocol-based product will be frozen at Version 3.1.2, which is scheduled to ship this month.

New MHS Alliance. Two dozen vendors, including Beyond, Inc., CE Software, Inc., Cheyenne Software, Inc., CompuServ, Da Vinci Systems Corp. and Reach Software Corp., will come together at NetWorld in Boston this week to form the MHS Alliance. The group will ensure interoperability of NetWare Message Handling System-based software.

Windows for Workgroup on VINES. Banyan Systems, Inc. last week announced that its VINES network operating system now supports Microsoft Corp. Windows for Workgroup clients, meaning VINES users will be able to achieve peer-to-peer networking capabilities while maintaining full access to Banyan's enterprise network services. Windows for Workgroup users will also now be able to connect to VINES servers, in addition to the servers already supported.

Lotus adds scheduling to mail. Lotus Development Corp. is expected to announce this week at NetWorld a scheduling utility that will be integrated with its cc:Mail messaging system. The utility is a network version of The Organizer, a single-user scheduling product Lotus recently purchased from a firm in the U.K.

MFS draws gun in Texas PUC corral. MFS Communications Company, Inc. last week filed a petition with the Texas Public Utility Commission requesting the adoption of rules and policies designed to open up the local loop to competition. MFS wants local telephone companies there to unbundle local access into building block components for use by all carriers, offer access to their central offices, and support resale or component resale.

CA to support Microsoft database API. Computer Associates International, Inc. (CA), based in Islandia, N.Y., this week will announce support for Microsoft Corp.'s Open Database Connectivity (ODBC) application program interface. That will give Microsoft Windows applications that support ODBC direct access to CA's CA-IDMS, CA-DATACOM and CA-DB databases via new database drivers slated for second-quarter availability.

CONTACTS

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Apple adds dial-up, WAN, TCP/IP support to router

Company will announce enhancements to its software-based router at NetWorld Boston show.

By Fred Paul
Senior Editor

BOSTON — At this week's NetWorld 93 show, Apple Computer, Inc. will introduce a series of enhancements to its software-based router, including support for routing AppleTalk over TCP/IP and wide-area net links.

NETWORLD 93 BOSTON

Like the existing AppleTalk Internet Router, which is strictly a local AppleTalk router, the new Apple Internet Router works with LocalTalk, Ethernet and token-ring local-area networks. But the new product will support dial-up wide-area connections, as well as optional wide-area X.25 links and local or remote Transmission Control Protocol/Internet Protocol-based links.

Other companies offer products with similar functionality, but analysts said the announcement should help reassure large corporate customers of Apple's commitment to enterprise netsworking.

Although Apple would not comment on the new Internet Router, product documents obtained by *Network World* indicate that the software works only on AppleTalk Phase 2 networks, requires a nondedicated Macintosh equipped with the System 7 operating system and at least 4M bytes of random-access memory.

The basic package supports dial-up connections between multiple AppleTalk networks via a V.32 9600 bit/sec or faster modem over standard phone lines.

In an attempt to pitch the product to large users, the router supports as many as 32 ports, an unlimited number of connected networks with up to 16 million attached devices, 5,400 router table entries and 32,000 zone table entries. By comparison, the previous version supported only eight ports and 1,024 networks.

The announcement should reassure users of Apple's commitment to enterprise networking.

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The optional AppleTalk/X.25 Wide Area Extension lets multiple AppleTalk networks communicate via X.25 packet-switched links, while the AppleTalk/IP Wide Area Extension links AppleTalk LANs over a TCP/IP network by encapsulating AppleTalk packets in TCP/IP.

The basic package is also designed to let third parties add more functions, including support for Novell, Inc.'s IPX protocol and Fiber Distributed Data Interface, as well as wide-area T-1, switched 56K bit/sec and Switched Multimegabit Data Service links. The first of these third-party options are also expected to be announced this week.

Analysts praised the large capacity and variety of connections supported by the new router but cautioned that it may not be suitable for high-end use.

"Users can not get these functions without having to spend thousands of dollars on high [hardware] products like the Gator Box from Cayman Systems [Inc.] and FastPath from Shiva [Corp.]," said Charles Likaszewki, chairman of The Network Strategies Group, an networking consulting firm in St. Paul, Minn.

John Morency, a principal at Strategic Network Consulting, Inc., an internetworking consulting company in Rockland, Mass., said the product is best suited for low-end applications.

"The architecture of the Macintosh operating system was never intended to be a real-time, intensive [networking] system," Morency said.

Banyan poised to release new VINES Version 5.50

Includes StreetTalk III and T-1, ISDN support.

By Caryn Gillooly
Senior Editor

BOSTON — Banyan Systems, Inc. is expected to announce this week a version of VINES that integrates the capabilities of the two current versions and includes the next generation of StreetTalk and enhanced wide-area connectivity.

VINES 5.50 will support Apple Computer, Inc. Macintosh clients, like VINES 5.0, and will allow remote booting of diskless workstations, like VINES 4.11, but it will be based on StreetTalk III, the latest version of Banyan's global directory service.

StreetTalk III, according to Banyan, will let developers more easily integrate StreetTalk with other vendor's directories. StreetTalk III will also let users search for resources by attributes, as opposed to names, and have management capabilities.

On the wide-area connectivity side, VINES 5.50 will include support for server-to-server connections over either T-1 or Integrated Services Digital Network links.

One of the primary features of StreetTalk III is its new Directory Integration Architecture.

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VINES 5.50, which was expected, will be officially announced and will begin shipping at NetWorld 93 Boston here this week ("Banyan bares product plan at user meet," *NW*, Sept. 28, 1992).

One of the primary features of StreetTalk III is its new Directory Integration Architecture. "WordPerfect, cc:Mail and Lotus Notes each require their own directory information, so each has its own directory," said William Ifrah, product manager of directory services at Banyan, based in Westborough, Mass.

StreetTalk III can store information from other directories. Banyan is making this possible by distributing tool kits that let other vendors sychronize their directories with StreetTalk.

Tracking printers

The second primary enhancement to StreetTalk is the Advanced Object Query Model. This lets administators label StreetTalk resources by attributes as opposed to simply names.

For example, printers can be identified by their profiles, where they are located, what fonts are available, what type of letterhead is loaded, when it was last serviced and more. Once labeled by attribute, the VINES user will be able to find resources by searching for their attributes rather

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Attachmate E-mail system works with IBM offerings

Product interoperates with PROFS, DISOSS, others.

By Bob Brown
Senior Editor

BOSTON — Attachmate Corp. will introduce a local-area network-based electronic mail and scheduling system at NetWorld 93 Boston this week that interoperates with existing IBM E-mail systems.

Users of Attachmate's new Zip/Office product will be able to exchange messages with IBM's Professional Office System (PROFS), OfficeVision, Distributed Office Support System and OV/400 E-mail offerings as well as among themselves.

The software, like Attachmate's bread-and-butter personal computer-to-mainframe offerings, is designed to help users make the most of their legacy systems while they are migrating to new technologies, said Wayne Smith, Attachmate's president and chief executive officer.

Smith

"We're providing enabling technology so that LAN-based mail systems and IBM mail systems, such as PROFS, can peaceably coexist," he said.

Zip/Office includes client and

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Chipcom to increase port density of intelligent hubs

By Skip MacAskill
Staff Writer

BOSTON — Chipcom Corp. will roll out at this week's NetWorld 93 Boston show a new version of its low-end intelligent hub that can support more ports because it does not need a dedicated controller module.

NETWORLD 93 BOSTON

The company is also expected to double the number of Ethernet users supported by its low- and high-end hub families through a new 24-port 10Base-T module.

In its low-end, six-slot ONline System Concentrator, Chipcom will eliminate the need for the ONline Fault-Tolerant Controller Module by integrating the device's functionality into a circuit board attached to the backplane.

The module is the first to feature Chipcom's ONdemand Bank-Switching technology.

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Because of its different physical architecture, the high-end, 17-port ONline hub will not provide this capability.

Users will be able to fill the vacated slot with any management, local-area network interface or internetworking module offered by the company, allowing the device to support 120 Ethernet, 40 token-ring or 16 Fiber Distributed Data Interface connections.

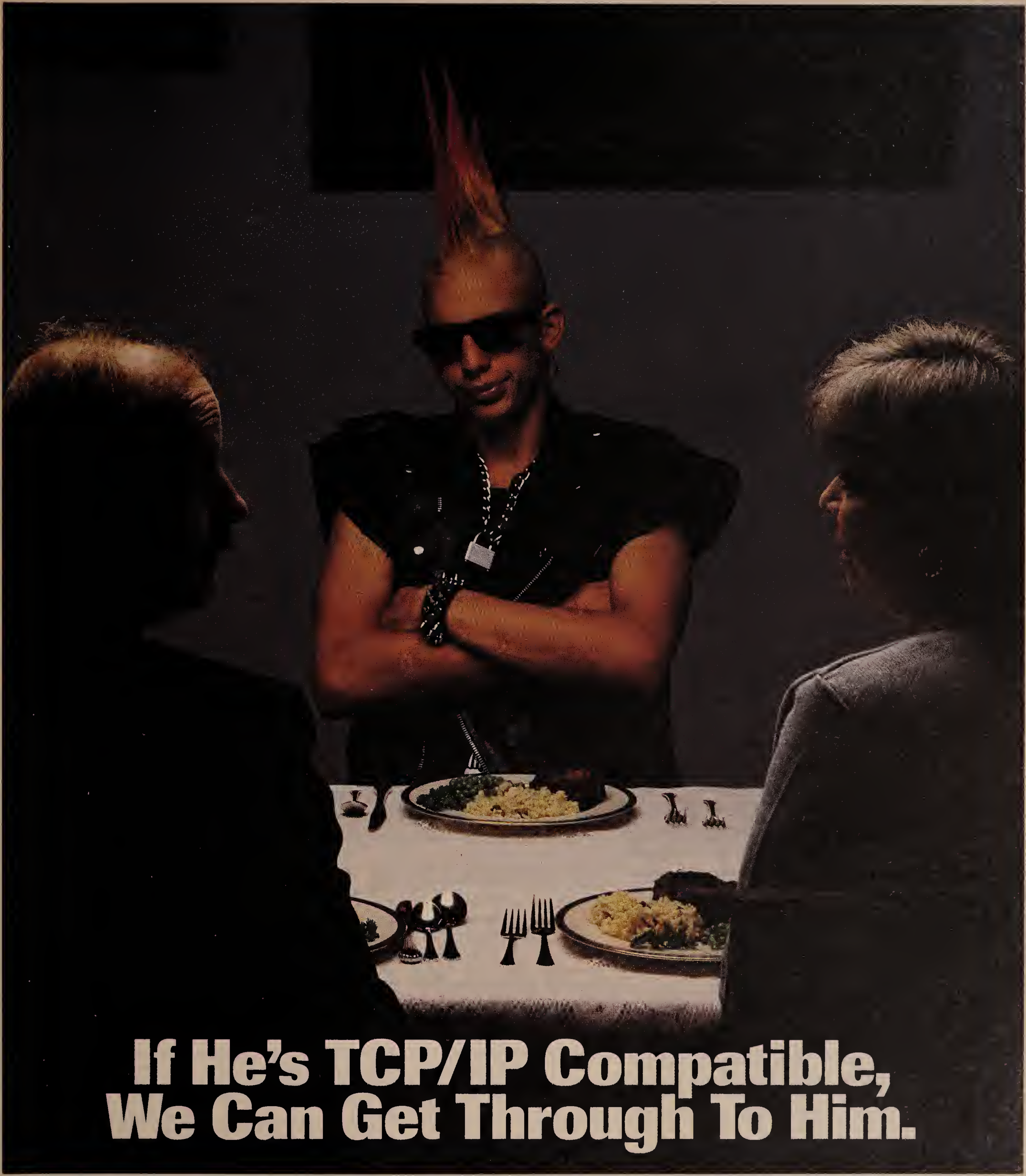
The integrated controller, which monitors concentrator temperature and power supply status, can also be configured as a backup to an installed controller module for redundancy.

The six-slot ONline hub with integrated controller function is available now and costs $1,695. The price for the same unit with backup supply is $2,295. Current users can purchase an upgrade kit for $595.

Chipcom's ONline 24-Port 10Base-T Module can be used in both the six- and 17-slot ONline concentrators and supports a maximum of 120 and 360 Ethernet users, respectively. The company's earlier module supports 12 connections.

The module is the first to feature Chipcom's ONdemand Bank-Switching technology, which allows it to support two sets of 12 users. Each group can then be logically switched among any of the three independent Ethernets supported by the ONline hub's TriChannel backplane architecture. This functionality is similar to the per-port switching capability on other Chipcom modules.

The ONline 24-Port 10Base-T Module costs $2,995 and will be available in 45 days.



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PC database exec named at Microsoft

By Wayne Eckerson
Senior Editor

REDMOND, Wash. — Accelerating its drive into the database arena, Microsoft Corp. last week named a topflight software professional from Apple Computer, Inc. to head its personal computer database division.

Roger Heinen, senior vice-president and general manager of Apple's Macintosh division, will become vice-president of Microsoft's Database and Development Tools division on Feb. 1.

At Apple, the 42-year-old Heinen was responsible for developing and marketing the Macintosh operating environment, as well as development tools and other services. Prior to joining Apple, he worked for 17 years at Digital Equipment Corp.

Heinen will be responsible for establishing a comprehensive strategy for Microsoft's PC databases and language products as well as improving relationships with developers and third parties, according to Mike Maples, executive vice-president of Microsoft's worldwide products group.

Maples has been acting head of the Database and Development Tools division since it was formed last year.

The division is responsible for Access, the recently announced Windows database and access tool, FoxPro databases and all programming languages. It also oversees the Open Database Connectivity specification, a widely supported application program interface for accessing remote databases from Windows applications.

The only database not under Heinen's jurisdiction is SQL Server, which falls in the Corporate and Network Systems unit.

Analysts said Heinen must ensure that Microsoft's databases have a consistent look and feel, much like the Macintosh products he has recently overseen.

"Heinen's experience at Apple will help remove the rough edges and achieve a consistent look and feel across the product line," said David McGoveran, president of Alternative Technologies, a market research and consulting group in Boulder Creek, Calif.

> Heinen must ensure that Microsoft's databases have a consistent look and feel.
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"While FoxPro and Access are potential competitors because they are PC databases, they can also complement each other depending on how they're managed and marketed," he added.

Judith Hurwitz, president of the Hurwitz Consulting Group in Newton, Mass., said Heinen will need to flesh out Microsoft's database offerings.

"You will see Microsoft aggressively develop tools to handle configuration management, version control, data integrity, security and transaction control, among other things," she said.

NIST takes steps to make frame relay part of IGOSS

Agency to launch multivendor trial of technology.

By Anita Taff
Washington Bureau Chief

GAITHERSBURG, Md. — The National Institute of Standards and Technology (NIST) last week announced it will kick off in February the nation's first multivendor trial of frame relay supporting Open Systems Interconnection applications.

The trial marks the first step toward incorporating frame relay into the Industry and Government Open Systems Specification (IGOSS). IGOSS is an industry-wide specification for OSI products developed by the U.S. and Canadian governments, the World Federation of MAP/TOP Users Group and the electrical power industry.

Participants in the trial are: AT&T, Sprint Corp., Cascade Communications Corp., Digitech Industries, Inc., FastComm Communications Corp., Hewlett-Packard Co., ISDN Systems Corp., NCR Corp., Netrix Corp., OST, Inc., Sun Microsystems, Inc., StrataCom, Inc. and 3Com Corp.

In the trial, public frame relay services provided by AT&T and Sprint will be used to interconnect packet-switching and local-area network gear at NIST sites.

Currently, frame relay is not part of the government's manda-

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Three firms win Internet, NREN info services deals

By Ellen Messmer
Senior Correspondent

WASHINGTON, D.C. — The National Science Foundation (NSF) last week selected three vendors to provide information services for today's Internet community as well as the future National Research and Education Network (NREN).

Calcari

Under a five-year cooperative agreement signed with NSF, AT&T will deploy a distributed X.500 "Directory of Directories" listing all the Internet databases, addresses and resources available to users.

General Atomics was picked to act as a network information center to identify the resources for the directory, while Network Solutions, Inc. will continue in its role as the Internet Transmission Control Protocol/Internet Protocol address registration service.

The number of academic, government and commercial databases and bulletin boards on the Internet remains uncounted, with estimates ranging from a few hundred into the thousands.

The NSF plan to pull this information together for easy — and free — access via an X.500 directory system is intended to give users a tool for exploring the Internet. "As more communities come onto the Internet, we need a way to reach out to them," said Don Mitchell, staff associate at NSF.

Besides identifying resources AT&T will list in the X.500 directory, General Atomics — which operates the California Research and Education Foundation Network — will offer training courses, a help desk and a database of networking materials called the Info Source.

Susan Calcari, director of network information services at General Atomics, has been designated the "info scout" for the program. Calcari said hypertext software called NICLink, a user interface offering access to the Info Source, will be distributed by April.

Under the NSF plan, AT&T will have both a white pages and yellow pages X.500 directory up and operational in April on a distributed system of Sun Microsystems, Inc. computers acting as servers.

The X.500 software will be based on the International Standards Organization Development Environment (ISODE) consortium's version of X.500 called Quipu, after the Incan word for search. The ISODE version can be accessed using both TCP/IP and Open Systems Interconnection protocols.

The NSF will not charge users or organizations for listing their Internet addresses in the white pages, but there will be a charge for advertisements in the yellow pages, Mitchell noted.

"We believe directory and information services will be an essential part of the national information infrastructure," said Erik Grimmelman, AT&T marketing director for Internet/NREN. "We view the Internet as an essential part of the community needing those services."

As part of the NSF award, AT&T will also set up new information databases under NSF direction. The databases will support the use of the Wide Area Information Server public domain search and retrieval software developed by Thinking Machines, Inc.

Grimmelman

AT&T will also support Archie, the indexing software invented by Peter Deutsch and Alan Emtage, partners in Bunyip Information Systems, Inc.

All three NSF awards, totaling $12 million over five years, mean more government-subsidized services for Internet users in anticipation of the establishment of NREN, the still largely undefined gigabit-speed net. But NSF officials last week warned that the free IP address registration may not continue indefinitely.

In the next 18 months, Mitchell said, the NSF expects to develop a new policy that will limit the types of organizations that can receive free IP address registration from Network Solutions.

RAD Data will offer SNA internetworking products

By Maureen Molloy
Senior Writer

MAHWAH, N.J. — RAD Data Communications, Ltd. next month will introduce a line of communications processors that let users carry SNA data on LAN internets by linking IBM SNA gear to token rings and Ethernets.

All of the four new processors are stand-alone units that convert data from IBM terminals, cluster controllers and other devices supporting traditional Synchronous Data Link Control and asynchronous protocols into Logical Link Control (LLC) packets. That will enable users to merge Systems Network Architecture traffic onto token-ring and Ethernet local-area networks for transport over multiprotocol backbones.

The STC-1 is an SDLC-to-token ring converter that links IBM cluster controllers to a 4M or 16M bit/sec token-ring LAN, eliminating the need for wide-area SDLC lines. It will be available by the end of the year and will cost $2,350.

The FTC-1 is a token ring-to-front-end processor (FEP)/SDLC converter that can be used to link remote site cluster controllers or front-end processors to a token-ring net. The LAN provides access to a router for wide-area connections.

The company said users can link remote token rings to Down-Stream Physical Unit devices such as 3745s and personal computer LAN gateways via high-speed links. The FTC-1 could save users money compared to employing the token-ring conversion capability within the FEP. The FTC-1 will be available by the end of the year. Pricing has not been set.

The third new product is the SEC-1, an SDLC-to-Ethernet converter that lets remote SDLC devices attach to Ethernets so that SNA data can be sent to an IBM host via a router. That eliminates the need for multiple low-speed, wide-area SDLC lines.

Once the SEC-1 translates traffic to an LLC format, it passes the packets to the Ethernet LAN. The data is then handed off to a router that translates it from an Ethernet to a token-ring format before sending it to a token ring-attached FEP at the host site.

The SEC-1 will be available this quarter. Pricing has not been determined.

The final product, the FEC-1, is an Ethernet-to-FEP/SDLC Converter that connects remote Ethernet LANs to an FEP via high-speed serial links. It will be available this quarter. Pricing has not been set.

RAD said all four converters will support both half- and full-duplex IBM devices. All four will also support Non-Return to Zero and Non-Return to Zero Inverted, which are IBM encoding schemes often used with SDLC to derive clocking information.

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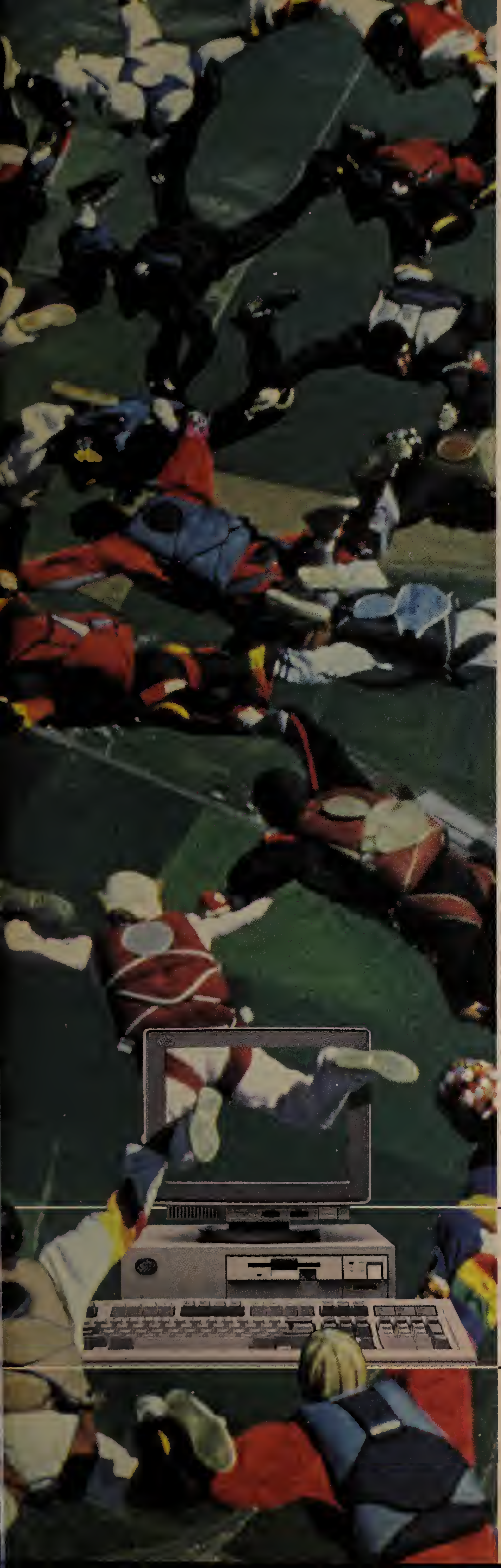

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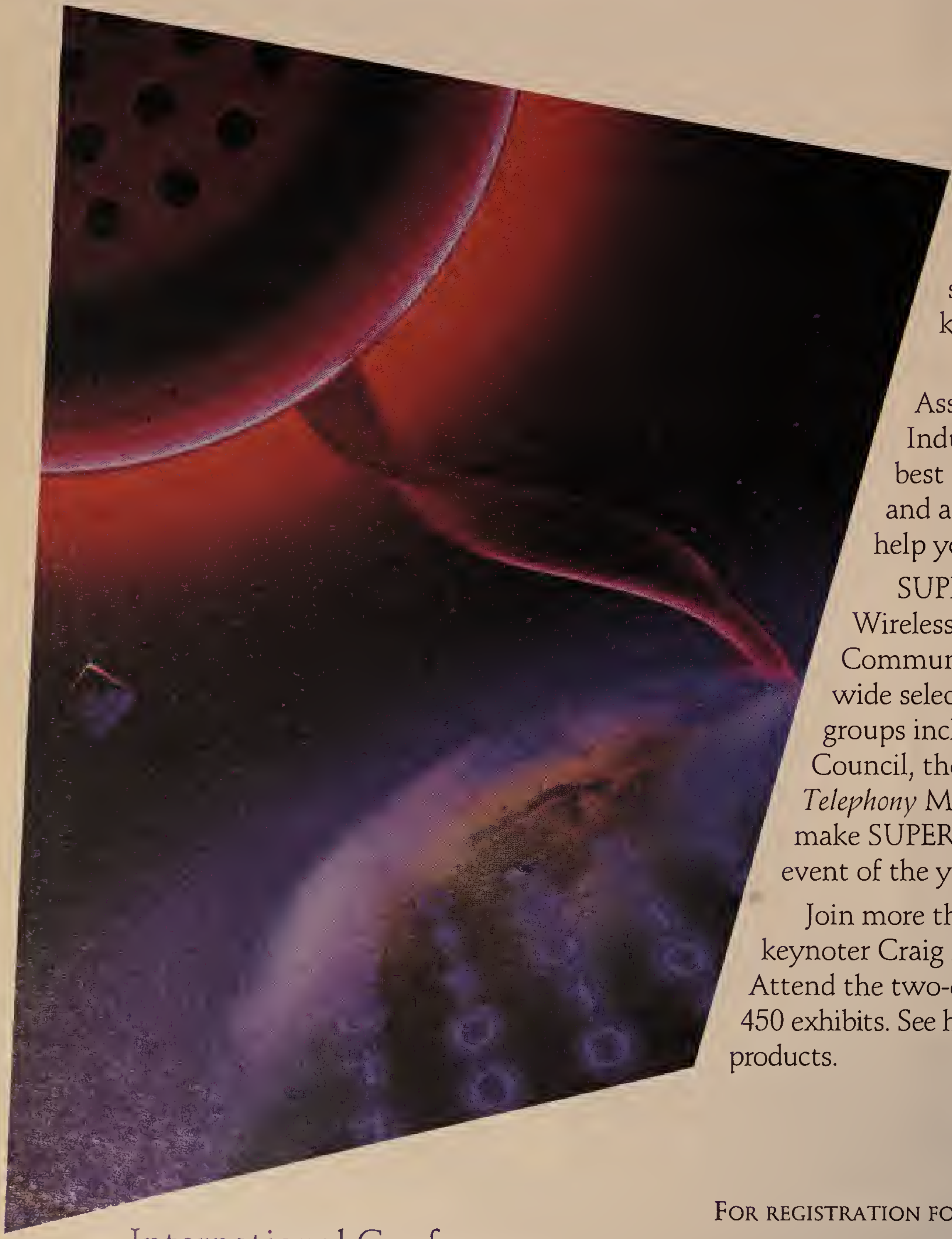

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The problem with E-mail interoperability

(continued from page 1)

set up nine individual product pairings and conducted bidirectional tests in each pairing.

Pairings were set up to test E-mail exchange in five different environments. One pairing tested E-mail exchange between two personal computers running Microsoft Corp.'s Windows, while another tested E-mail exchange between a DOS-based PC and an Apple Computer, Inc. Macintosh. Three pairings tested E-mail exchange between a Windows-based PC and a Macintosh, while another two pairings tested E-mail exchange between a Sun Microsystems, Inc. workstation running SunOS, Sun's version of Unix, and a Macintosh.

The final two pairings tested E-mail exchange between a SunOS-based workstation and a Windows-based PC.

In order for some of the test pairs to work, the test team had to use gateways that translated various E-mail formats and transfer protocols. A conscious attempt was made to use low-end and, therefore, low-cost gateways, as many users would be tempted to install these before expensive, highly functional gateways.

The test team used various vendors' implementation of Novell, Inc.'s Message Handling System (MHS) and Simple Mail Transfer Protocol (SMTP), which is a part of the Transmission Control Protocol/Internet Protocol suite (see products chart, page 12). Some of the tests incurred problems using an MHS-based gateway. So the test team repeated those tests using an SMTP gateway and obtained different, but not necessarily better, results.

The test bed included PC-based file servers and gateways, as well as PC, Macintosh and Unix clients connected via an Ethernet network. This setup enabled testers to send messages and attached files between E-mail products made by the same vendor running on disparate workstations and between products made by different vendors running on similar and dissimilar workstations (see graphic, page 14).

Stephen Mattin, Focus Software's chief engineer

Methodology

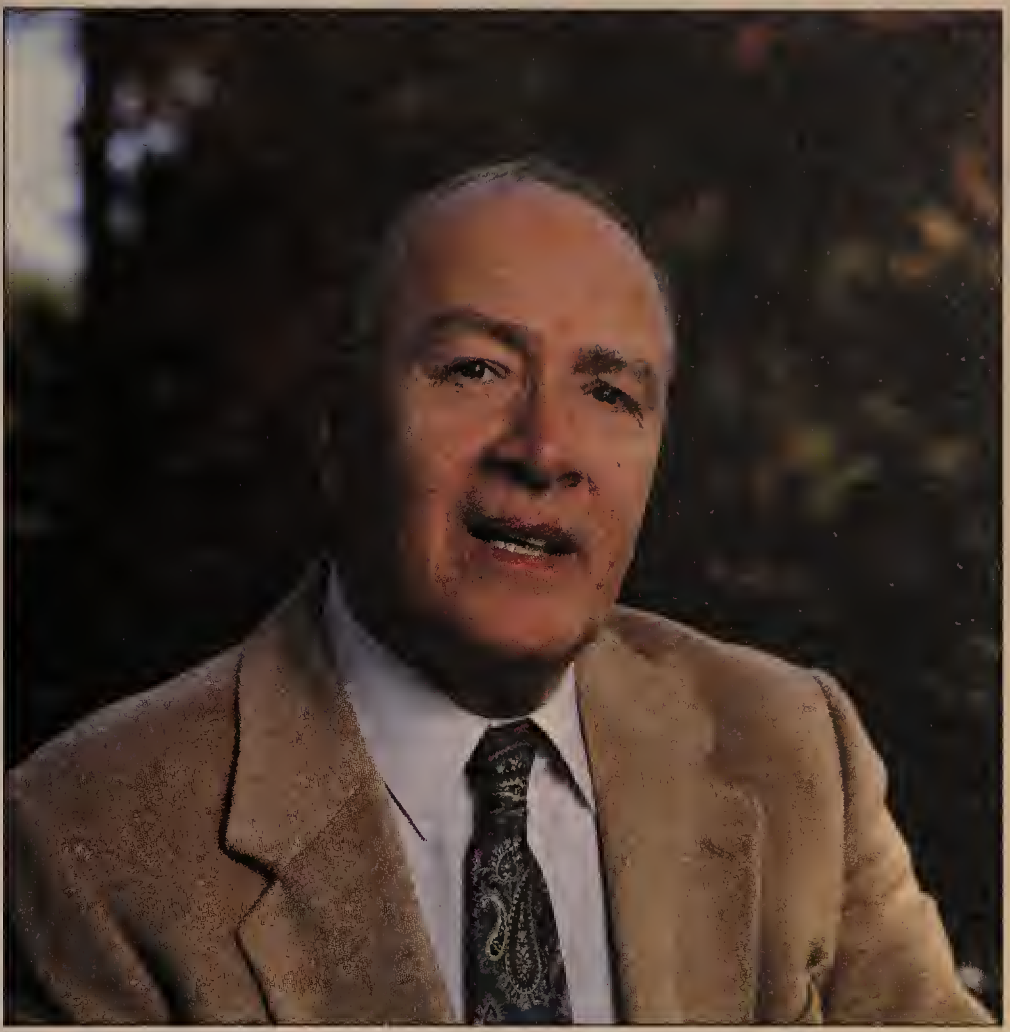
Each E-mail client was first tested individually to determine the functionality it supported. In this initial test, messages were exchanged between a single vendor's product running on the same type of workstation to establish a baseline of functionality. This baseline enabled the test team to quickly determine a set of common functions supported by each E-mail client.

A set of eight test cases were then set up to determine the interoperability among the various packages. Each test case consisted of an E-mail message header, a message body containing a limited amount of text and at least one attached file.

In five cases, a message with a single attached ASCII file ranging in size from 1K byte to 3.7M bytes was sent to as many as three addresses. One test involved transmission of a message with an attached 110K-byte file containing ANSI standard formatting commands, such as underlining, to one address.

In another case, a text message with an attached WordPerfect Corp. WordPerfect document, Microsoft Word document and a PostScript document was sent to one address. In the last case, a message with an attached Graphic Interchange Format graphic file, a compressed archive file and an executable program was sent to two addresses.

In each test case, the receiver was requested to send a receipt once the E-mail arrived. The receiving node was also instructed to display an incoming mail notification on screen and save the E-mail to disk. Several client workstations and gateways had insufficient disk space to complete the test in which a 3.7M byte file was attached to an E-mail message.



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Ugo Gagliardi, founder and president of Focus Software, Inc.

The information received was then carefully examined by the test team to detect any changes introduced in transmission. Any necessary corrections were made. The receiver then sent the original E-mail back to the sender, where the receipt, notification and save process was completed again. This gave a good indication of bidirectional capabilities within each test pairing and enabled the test team to detect varying levels of lost functionality within test pairs.

In some test cases, a priority feature was used to mark messages for urgent or normal delivery. Likewise, some test cases required the receiver to send a reply while others did not.

The test team noted any problems encountered when exchanging E-mail. Those problems fell into one of two classes; major or minor. A major problem occurred when messages and attachments were not received or attached files were received corrupted and could not be reconstructed. A minor problem occurred when the receiving E-mail client had trouble providing basic functionality such as sending a receipt, notifying the user of incoming mail or identifying priority mail (see test results chart, page 12).

The results

The testing found that the exchange of E-mail worked much better in some environments than others. For example, E-mail exchange between products that did not require a gateway was much better than in those that did require a gateway. Likewise, there were few problems in exchanging E-mail between a single vendor's product running on different platforms.

There were also some interesting results turned up in the individual test cases. For example, sending three formatted documents as attachments to a message proved to be the test case that encountered the most problems. A problem occurred in 13 of the 18 times this test was run. Five of those problems were major while the remaining eight were minor.

The exchange of E-mail worked much better in some environments than others.

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Oddly, the test in which three binary files were exchanged turned up only two major problems and eight minor problems. For the most part, these minor problems occurred when the binary files were received in the body of the message instead of as three attachments, when the binary files were received as a single attachment or when a mail receipt made it appear the binary files were not received when indeed they had been.

Many of the major problems in these two test cases can be attributed to using gateways that limit the number of attachments that can be sent in one message or E-mail transport protocols that create an envelope containing binary information that attempts to describe the file contents to the receiving E-mail client. Gateway problems caused many of the documents to be lost in transmission while enveloping problems caused files to be received corrupted.

The test cases with the least number of problems were those in which a message with an attached 33K-byte ASCII file was sent to two addresses and a message with an attached 1.3M-byte ASCII file was sent to two addresses.

There were eight problems in each case. Only one of the problems in sending the 33K-byte ASCII file was major while there were three major problems in sending the 1.3M-byte ASCII file.

Some of the problems were clearly due to incompatible gateways. Lotus Development Corp.'s cc:Mail, CE Software, Inc.'s QuickMail and Microsoft Mail all use proprietary formats for E-mail messages and transfer protocols. Da Vinci Systems Corp. eMail uses MHS as its native E-mail protocol. MHS is also used as

(continued on page 12)

E-mail interoperability by test pair

	Windows to Windows		Windows to Macintosh						DOS to Macintosh		SunOS to Macintosh				SunOS to Windows			
Test case	cc:Mail to MS Mail	MS Mail to cc:Mail	MS Mail to cc:Mail	cc:Mail to MS Mail	MS Mail to MS Mail	MS Mail to MS Mail	cc:Mail to cc:Mail	cc:Mail to cc:Mail	DaVinci to QMail	QMail to DaVinci	MailTool to cc:Mail	cc:Mail to MailTool	cc:Mail to MS Mail	MS Mail to cc:Mail	MailTool to MS Mail	MS Mail to MailTool	cc:Mail to cc:Mail	cc:Mail to cc:Mail
Mail 1K byte limited text file to 1addressee	P	P	—	P	—	—	—	—	—	—	P	P	P	P	P	P	P	MP
Mail 7K byte limited text file to 1addressee; Reply	P	P	—	P	—	—	—	—	—	—	P	P	P	P	P	P	P	MP
Mail 33KB byte limited text file to 2 addressees	P	P	—	P	—	—	—	—	—	—	—	P	P	P	—	P	—	MP
Mail 1.3M byte limited text file to 2 addressees; Reply	P	P	—	P	—	—	—	—	—	—	—	P	P	MP	—	P	—	MP
Mail 3.7M byte limitedtext file to 3 addressees	P	P	NA	NA	—	—	—	—	—	—	NA	NA	P	NA	MP	P	NA	NA
Mail 3 documents to 1 addressee	MP	P	P	MP	—	—	—	—	—	P	MP	P	P	MP	P	P	P	MP
Mail 3 binary files to 2 addressees	MP	P	P	MP	—	—	—	—	—	P	—	P	P	P	—	P	—	P
Mail 110K byte formatted text file to 1 addressee	P	P	—	P	—	—	—	—	—	—	P	P	P	P	MP	P	P	MP

P= Minor problem MP= Major problem NA= Test not performed due to disk space limitations MS Mail= Microsoft Mail

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(continued from page 11)

a common interchange language in many PC E-mail products, with vendors and third parties supplying gateways to translate their proprietary E-mail protocols to MHS and the Internet RFC822/SMTP standards.

In some cases, there are compatibility issues between the E-mail user clients and gateways or between gateways. Some of these are due to the integration of updated E-mail protocols. For instance, the Server Message Format (SMF) protocol used in MHS has three versions — SMF-64, SMF-70 and SMF-71 — in current use. Not all products adhere to the latest standard, SMF-71, and others fail to provide backward-compatibility with older versions such as SMF-64.

The lack of support for the latest SMF standards in cc:Mail's MHS Gateway that uses only SMF-64 severely limited its interoperability with other vendor's products, including interoperation with Novell's NetWare Global Messaging (NGM) software. The test team discovered that NGM only supports SMF-70 and SMF-71, both of which allow multiple attachments to an E-mail message and, therefore, could not use the product in testing.

The fewest problems occurred in sending E-mail between DOS-based PCs and Macs.

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Environmental findings

The fewest problems occurred in sending E-mail between DOS-based PCs and Macintoshes. In this environment, E-mail was exchanged between CE Software's QuickMail for Macintosh and Da Vinci's Da Vinci eMail for DOS. Only two minor problems occurred, both when sending from QuickMail to eMail. A message with three attached documents was received as three separate messages instead of one. However, all three documents arrived intact. The same thing occurred when a message and three attached binary files were sent.

Da Vinci's eMail is the only product tested with built-in MHS support, which provides direct access to an MHS gateway. Other products require add-on software to perform this function. The PC running eMail was connected to a gateway running Novell's NetWare MHS Network Edition 1.5, which was in turn linked to a gateway running StarNine Technologies, Inc.'s MailLink MHS for QuickMail.

Da Vinci's eMail is the only product tested with built-in MHS support.

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There were also few problems in sending E-mail between Windows-based PCs and Macintoshes. In this environment, three test pairings were used.

The test team found no problems in exchanging messages and files between Mircosoft Mail for Windows and Microsoft Mail for the Macintosh. Similar results were obtained when sending messages and files between cc:Mail on a Windows-based PC and cc:Mail on a Macintosh. Interestingly, these are the only two pairings that did not require the use of a gateway.

But problems did crop up when E-mail was sent between cc:Mail for the Macintosh and Microsoft Mail for Windows using Lotus' MHS-based cc:Mail Gateway. Major problems cropped up when the gateway failed to deliver two of the three documents and two of the three binary files sent from cc:Mail for the Macintosh to Microsoft Mail for Windows.

When using an SMTP gateway to send the documents from cc:Mail for the Macintosh to Microsoft Mail for Windows, all three documents were received but one was corrupted by the binary data used to create the envelope that described the message content. The envelope data conflicted with binary data cc:Mail inserts to describe message content to other cc:Mail users. When the test team manually stripped away the evelope wrapped around the WordPerfect document, it was difficult to distinguish when the envelope information stopped and the document started, so the document was corrupted.

Oddly, only minor problems popped up when sending the documents and binary files from Microsoft Mail for Windows to cc:Mail for the Macintosh through an MHS gateway. All three documents and binary files were received as separate messages instead of as attachments to a single message.

When using an SMTP gateway, the three documents were received, but the file names were changed. Upon close examination, two of the files contained the same document. The actual third document never made it over. As for the binary files, all three were received as attachments, but the received files were larger than those sent; therefore, the file contents could not be verified.

There were a few other problems in sending E-mail from cc:Mail for the Macintosh to Microsoft Mail for Windows. For instance, receipts requested by cc:Mail for the Macintosh were not received while those requested by Microsoft Mail for Windows were received. This is apparently due to some addressing problem that caused the cc:Mail for Macintosh client to display an unknown destination host or work group message when requesting a receipt. The same addressing problem prevented cc:Mail for the Macintosh from replying to Microsoft Mail for Windows.

Microsoft Mail and cc:Mail continued to have similar problems in the Windows-to-Windows environment, particularly when attempting to exchange multiple attached documents or binary files. When sending the documents from cc:Mail for Windows to Microsoft Mail for Windows through Lotus' MHS-based gateway, only the first one arrived. The other two never made it over.

E-mail packages tested

- CE Software, Inc.'s QuickMail for Macintosh Version 2.51
- Da Vinci Systems Corp.'s Da Vinci eMail for DOS Version 2.0
- Microsoft Corp.'s Microsoft Mail for PC Networks Version 3.0 (Windows and Macintosh clients)
- Lotus Development Corp.'s cc:Mail for Windows Version 1.11, cc:Mail for Macintosh Version 2.0 and cc:Mail for Unix Version 1.00
- Sun Microsystems, Inc.'s MailTool Version 3

Gateway products tested

- Lotus' cc:Mail Gateway Version 3.21
- Lotus' cc:Mail Link to SMTP/UUCP Version 2.00, a beta-test version
- Microsoft's Microsoft Mail MHS Gateway, a final beta-test 3.0 Rev-6300 version
- Microsoft's Microsoft Mail Gateway to SMTP Version 3.00
- Novell's NetWare MHS Network Edition Version 1.5N, Rev. B, delivered with Da Vinci eMail
- StarNine Technologies, Inc.'s MailLink MHS for QuickMail Version 2.00

Using SMTP, the first document sent from cc:Mail for Windows to Microsoft Mail for Windows is received as an attachment while the other two are included in the message body. The third document was received corrupted because it was missing characters at the end of lines.

The test team attempted to send binary files from cc:Mail for Windows to Microsoft Mail for Windows through an MHS gateway four times. The first three turned up negative results. On the fourth try, only one of the binary files was received. When using an SMTP gateway, the binary files were received as three separate attachments.

Oddly, only minor problems occurred in the other direction. When the documents were sent from Microsoft Mail for Windows to cc:Mail for Windows using the MHS gateway, they all arrived as separate mail messages instead of as attachments to one message. When SMTP was used, the documents arrived as three attachments but the file names were changed. One of the files contained a duplicate copy of one of the documents, meaning the third document was never received. One of the received documents suffered file format changes and was thus corrupted.

When the binary files were sent from Microsoft Mail for Windows to cc:Mail for Windows using the MHS gateway, they arrived as separate messages instead of as attachments to one message — a minor problem. Using SMTP, the binary files were received as a single message and

(continued on page 14)

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(continued from page 12)

could not be verified as they were all larger than the original files, another minor problem.

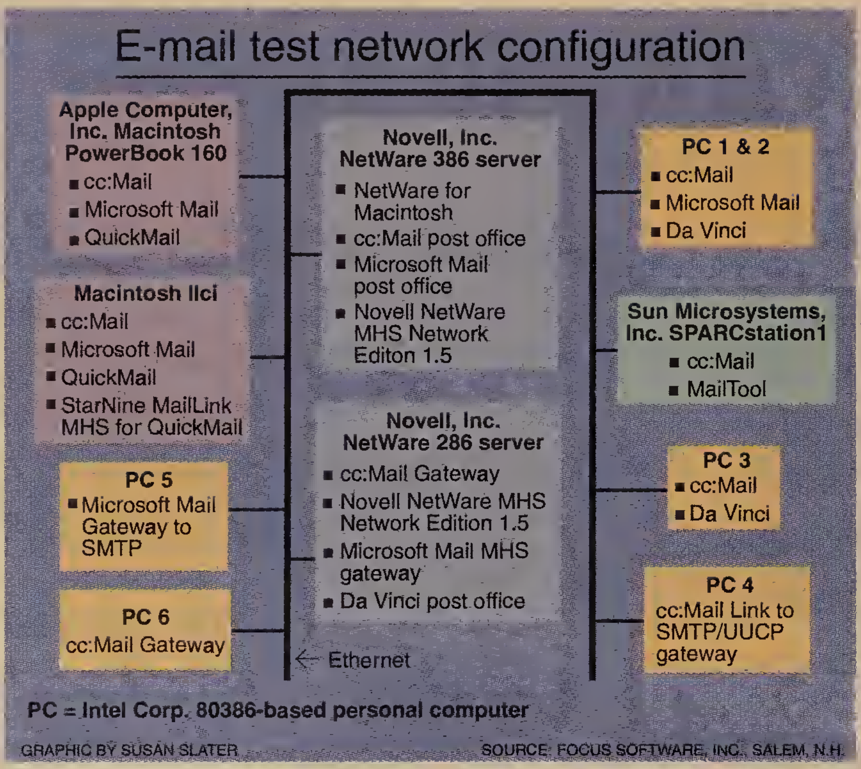
A string of minor problems kept popping up in this pairing. For instance, receipts requested in either direction were not delivered. Likewise, message priority settings had a difficult time working in this pairing. Some messages marked for priority delivery by Microsoft Mail for Windows were received as if they were set for normal delivery by cc:Mail for Windows. Any priority setting made in a message sent from cc:Mail for Windows to Microsoft Mail for Windows was ignored.

The unfriendly environment

The problems encountered in the previous environments were nothing compared to the ones encountered in exchanging E-mail between Unix and non-Unix environments.

The most major problems encountered in the testing were when E-mail was sent from cc:Mail for Windows to cc:Mail for Unix through Lotus' cc:Mail Link to SMTP gateway.

Here again, some of the problems may be attributed to the gateway. SMTP only supports the exchange of limited ASCII text messages. Messages with multiple attachments, known as multipart messages, and any binary files must be encoded and contain an envelope that identifies the contents of the message and any attachments.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MailTool
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cc:Mail
Da Vinci
PC 4
cc:Mail Link to SMTP/UUCP gateway
PC = Intel Corp. 80386-based personal computer

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Until recently, SMTP gateways used a technique known as uuencode to accomplish this task. The message must be decoded using a technique called uudecode before it can be read by the receiving node.

The uuencoding process balloons file sizes by as much as 35%. The extra information is used to define the type of message being encoded, whether it is a binary file, voice message or graphic, as well as the file name, owner and access privileges. Because some of the original files were so big, the test team ran into disk space problems with uuencoded files and, on several occasions, the SMTP gateway crashed under the heavy load.

To overcome these encoding problems, the Internet Engineering Task Force recently published its Multipurpose Internet Mail Extensions (MIME) standard in Request for Comments 1341. MIME defines multipart messages, encoding methods for binary files and standard message header fields used to create the envelope. However, none of the products tested support MIME, but Lotus said MIME support will be added to cc:Mail.

There were major problems in sending ASCII files from cc:Mail for Windows to cc:Mail for Unix. All the files were received corrupted as they were missing characters from the ends of lines and could not be verified.

Another major problem cropped up when sending the documents from cc:Mail for Windows to cc:Mail for Unix. The documents were received in an attachment labeled "untitled" and were corrupted. Once the documents were extracted from these untitled attachments, the test team found that some characters at the end of lines were missing.

There was only a minor problem in sending the binary files from cc:Mail for Windows to cc:Mail for Unix. The files were received as one attachment instead of three but were not corrupted.

There were a few minor problems in sending E-mail in the other other direction, from cc:Mail for Windows to cc:Mail for Unix. For instance, the three documents were received inside the message body instead of as attachments. Many of the tests in this direction had to be redone when some of the larger files and multiple attachments caused the gateway to crash.

Receipts were not delivered in any of the test cases in this pairing. Priority settings on E-mail sent to cc:Mail for Unix were ignored due to a limitation in the SMTP gateway.

There were major problems in the other test pairing in the Unix-to-Windows environment. When sending the 3.7M-byte ASCII file and 110K-byte formatted file as separate messages from MailTool for Unix to Microsoft Mail for Windows, MailTool warned the sending user that it may be unable to transfer the files intact because of their large size. Indeed, the 3.7M-byte file was received corrupted, and the formatting in the 110K-byte formatted file was

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changed. These problems were presumably the fault of errors made in the uuencode/uudecode process.

Several minor problems occurred in this pairing, as well. ASCII files were sometimes received in the message text instead of as an attachment. Receipts sent to Microsoft Mail for Windows were marked returned mail, which is misleading. Receipts sent to MailTool were marked registered mail, which is also misleading.

> **S**till more major problems cropped up in the Unix-to-Macintosh environment.
>
> ▲▲▲

Still more major problems cropped up in the Unix-to-Macintosh environment. When sending the three documents from MailTool for Unix to cc:Mail for Macintosh through an SMTP gateway, one document was received as an attachment while the other two were lumped together in a second attachment. One of the documents was corrupted after suffering formatting changes.

There was a minor problem in sending the documents in the other direction, from cc:Mail for the Macintosh to MailTool for Unix. One of the documents was corrupted after suffering formatting changes.

Another major problem came up when the three documents were sent from Microsoft Mail for the Macintosh to cc:Mail for Unix through an SMTP gateway. All three documents were received in a single attachment but one of them was corrupted by binary data inserted at the top of the file by cc:Mail in the uuencode process. A minor problem occurred when sending the documents from cc:Mail for Unix to Microsoft Mail for the Macintosh. Two of the documents were received in the message body instead of as attachments.

Another major problem occurred when Microsoft Mail for the Macintosh sent a 1.3M-byte file to cc:Mail for Unix. The file could not be uudecoded and cc:Mail for Unix crashed when trying to read the attachment with the file in it.

Some of the minor problems in this pairing include the inability of Microsoft Mail for the Macintosh to send a receipt to cc:Mail for Unix and the fact that some files sent from cc:Mail for Unix wound up in the body of the message received by Microsoft Mail for Windows.

Conclusions

It is important to note that interoperability problems are unavoidable in many cases because there are no products or vendors that support all possible platforms.

For example, Unix workstation users may not be able to run DOS products — although emulation technology is rapidly solving this — and DOS users may not be able to run Unix software.

In many cases, it is simply not practical or cost-effective to settle on one vendor's E-mail approach and force feed it to everyone in the organization. Settling on a single vendor may pose too much of a learning curve problem for those users not familiar with the chosen package.

Instead, managers designing an E-mail conduit should take special care to understand the drawbacks and limitations of trying to make certain packages work together.

Furthermore, managers must look for ways to minimize the number of E-mail post offices and gateways in their interconnected LANs. Clearly, there is a delay every time a message has to pass through a gateway or server-based E-mail post office. The more gateways and E-mail post offices, the more failure points there are in the internet.

The testing also found that sending large or multiple file attachments in an E-mail message stresses the gateway's and mail server's disk space as well as CPU. So, institute a policy to discourage users from sending large file attachments to messages unless your E-mail network design can accommodate it.

And, obviously, users should test their E-mail internetworks before putting them into production.

In the meantime, understand that the uneven support for existing standards and the lack of universal standards for E-mail formats and addressing will continue to cause problems for users for some time to come. ☑

Brown is managing editor, features, and Mattin is chief engineer at Focus Software, Inc. in Salem, N.H.

Testing was conducted in Focus Software, Inc.'s Salem, N.H.-based laboratory. Focus is a founding member of the *Network World* Test Alliance. The company provides network software testing services to end users and vendors as well as network and systems consulting services to Fortune 500 firms.

Focus is publishing a comprehensive 212-page electronic mail interoperability report that includes the full results of the tests mentioned in this story.

The report, titled "Focus on E-Mail Interoperability," can be purchased from Focus. For more information and pricing, call Margo Harrison at (603) 890-1000.

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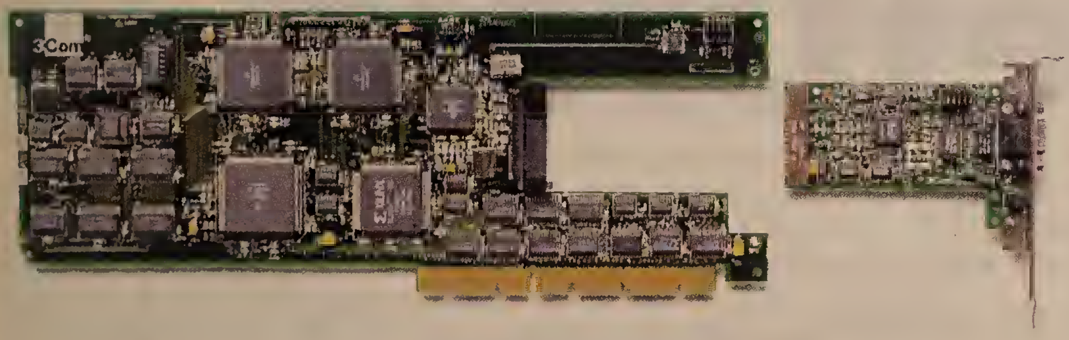

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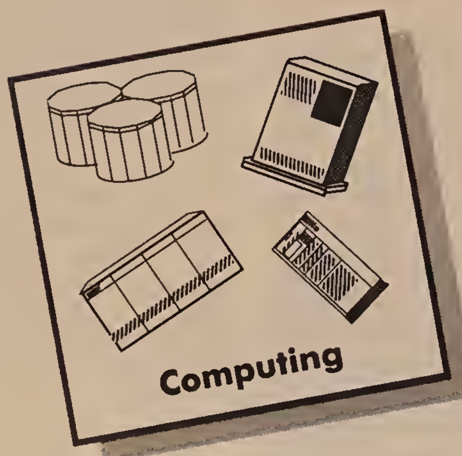

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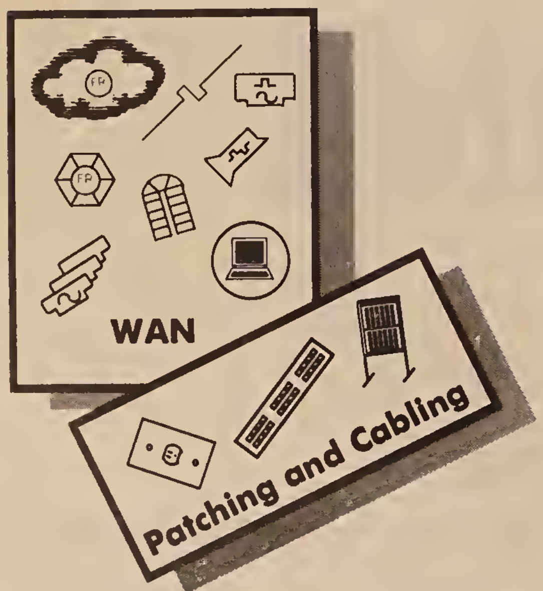

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TA110	Terminal Adapter	1 Ch. @ 64K 1 Ch. @ 16K	ISDN	X.25 PAD
TA120	Terminal Adapter	2 Ch. @ 64K 1 Ch. @ 16K	ISDN	Supports Voice & Data
TA220	Terminal Adapter	2 Ch. @ 64K 1 Ch. @ 16K	ISDN	Combines "B" Channels
FT100S	DSU/CSU	56K-1.544Mb	T1/ Frac. T1	Single Port
FT100	DSU/CSU	56K-1.544Mb	T1/ Frac. T1	Dual Port (Expandable)
DDS/MR1	DSU/CSU	56 Kbps	DDS	All DDS Rates
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Worth Noting

> "In the beginning, we did real good showing and explaining to users how LU 6.2 worked, but we gave them no clue how to use it. We were dumb."

Lance Bader
Senior programmer
IBM's APPC market
enablement group
Research Triangle Park, N.C.

Data Packets

NetLabs, Inc. of Los Altos, Calif., last week brought out software that serves as a network help desk by letting network managers track and resolve problems and retain solutions for future use.

The software, called NetLabs/ServiceDesk, runs as an application on top of the NetLabs/Manager network management system. It receives input on device failures and other events from user-defined alarms, then assists the user in solving the problem.

The application includes a relational database and a feature that routes alarms to appropriate network managers.

NetLabs/ServiceDesk costs $12,000 for four users and will be available in the first quarter.

Triton Technologies of Iselin, N.J., has unwrapped a new release of its Session/XL product that features increased performance, Windows compatibility and expanded protocol support. Session/XL lets users schedule automated, unattended file transfers between a central personal computer and multiple remote PCs at asynchronous communications speeds of 115.2K bit/sec.

Session/XL is priced at $129 and is available now. ☐

IBM's financial free-fall

Mounting problems:

- $7 billion 4Q pretax charges for job cuts
- 25,000 employee cutbacks slated for 1993, on top of 40,000 already let go
- $1 billion cut from R&D budget
- Stock price falls from just over $100 a year ago to $48 in December 1992

IBM's Networking Systems strengths:

- Over 12,000 employees largely unaffected by recent cutbacks
- Revenues grown modestly in past 3 years to $10 billion to $14 billion
- In December, John Akers, IBM's CEO, labels the business group a vital resource

GRAPHIC BY SUSAN J. CHAMPENEY

SOURCE: *NETWORK WORLD*

Tough times turning IBM attention to networking

Mainframes losing ground to client/server PCs.

By Michael Cooney
Senior Editor

IBM's current financial woes may help its networking business rather than hurt it.

Facing expected fourth-quarter and year-end losses and a plummeting stock price, IBM has announced it will cut an additional 25,000 employees next year, on top of the 40,000 already let go, and trim its vaunted research and development by $1 billion. The downward spiral is being generally attributed to a shrinking demand for mainframes and a sour economy.

> "The networking people are seen as the group that could hold things together."
>
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While the gloom and doom of the financial situation is spread throughout IBM's business groups — especially Enterprise Systems, home of mainframe development — analysts and users say the company's networking business may come out unscathed.

"There is a 'sink or swim' mentality around IBM right now, and the IBM networking people will feel that pressure a bit more than the rest of the company because they are seen as the group that could hold things together," one analyst said privately. "IBM will now temper its mainframe development with PC-based client/server improvements."

IBM executives have backed that up in recent weeks. Nick Donofrio, IBM's central mainframe executive, told the *Wall Street Journal* in December that mainframe technology "isn't where the action is anymore."

Ajit Kapoor, vice-president and director of advanced information processing for the META Group consultancy in Westport, Conn., agreed. "IBM needs to develop its networking technology outside the realm of the mainframe. IBM's moves in the client/server arena are good, but it always has to fight being mainframe-centric."

Analysts expect that to happen in the coming year. They expect IBM to focus on client/server computing and other enabling networking technologies such as its Advanced Peer-to-Peer Networking (APPN) and Advanced Program-to-Program Communications.

"IBM will use technologies like APPN and APPC to make networks more independent," said Rick Villars, an analyst with the International Data Corp. consultancy in Framingham, Mass. "Any cuts in R&D wouldn't come from networking technology but in IBM hardware."

While networking development will not be slowed, users worry that service could suffer.

"When IBM talks about cutbacks, we always have some apprehension about what that'll do

(continued on page 21)

User maps out new course in DCE use

Oil and gas company chooses technology to help it migrate from centralized to distributed apps.

By Michael Cooney
Senior Editor

DALLAS — For most users, Distributed Computing Environment (DCE) technology is still a futuristic means of building distributed applications, but at Haliburton Co. the future is now.

The oil and gas exploration company has installed a pilot network of more than 100 IBM, Hewlett-Packard Co. and Digital Equipment Corp. workstations to test multivendor DCE-compliant platforms, all linked via a Transmission Control Protocol/Internet Protocol network.

Ultimately, the company wants to base any new corporatewide distributed scientific and engineering applications on DCE technology, leaving only existing applications on the mainframe.

"Until now, all of our applications have been large, centrally located, monolithic SNA applications," said Murray Laidley, strategic business unit manager at Haliburton.

According to Laidley, the company wants to use DCE technology to distribute its oil and gas exploration applications so they run on machines that are readily available to users. Also, the firm wants to make DCE the common denominator for the various Unix workstation platforms it uses for application development.

"We are now migrating away from [centralized applications] to distributed applications using Unix, and we want DCE to give us the Unix interoperability we'll need," Laidley said. "The centralized applications didn't give us flexibility."

DCE is the Open Software Foundation, Inc.'s set of standards for building distributed, cooperative processing systems. For example, DCE defines directory and data sharing services so that users can gain access to network resources no matter where they reside.

Many vendors have announced support for DCE, but few have delivered it, leaving early implementors such as Haliburton wanting more. Haliburton has implemented DCE products from three vendors so far: IBM on its

(continued on page 20)

Room videoconferencing to entice low-end users

By Joanne Cummings
Senior Writer

DANVERS, Mass. — PictureTel Corp. is scheduled to unveil today a low-end room videoconferencing system that costs about half as much as the company's high-end System 4000 but offers comparable features.

In addition, the company is reducing the price of existing models by an average of 20%.

According to Randall Smith, vice-president of group videoconferencing systems at PictureTel, the moves are targeted at enticing more users to adopt videoconferencing as well as to enable users to cost-justify equipping second-tier sites with systems.

"Most of our customers install videoconferencing in only their primary sites because, at $40,000 to $60,000 a site, it's too costly to equip every site," Smith said. "This announcement should make it easier to fully equip a company with videoconferencing."

The new system, called the Model 150, will replace PictureTel's previous low-end systems, the Model 20 and Model 100, which were priced at $20,000 and $23,000, respectively. "We were able to reengineer the system and provide more features at a lower cost," Smith said. The Model 150 is priced at $18,500.

The Model 150, which will be able to interoperate with any other model in the System 4000 line, comes standard with a pan, tilt and zoom camera, a 20-in. color

(continued on page 20)

User maps out new course in DCE use

continued from page 19

AIX RISC System/6000, HP on its HP-UX HP 6000 and DEC on its DECstation 5000 running Ultrix.

Laidley classified the lack of products as the firm's biggest problem with DCE.

"We'd like to move faster, but we are paced by the availability of DCE products," he said.

For example, IBM's AIX DCE products won't include support until June for the Enhanced Distributed File System/6000, which lets users access files anywhere on the network.

Despite the drawbacks, Haliburton has been able to move ahead.

"Right now, we are testing the products from those companies to ensure interoperability, and so far, we've had no problems," Laidley said.

Because of their relative simplicity, Laidley said he expects DCE-based scientific and engineering applications to outperform the company's older applications.

"We've been measuring network performance and have seen some improvement, but we haven't really been looking that hard yet," Laidley said. "The performance and economics issues are secondary to us right now because we're really just trying to make it work."

While the company wants to use DCE technology to build new internal distributed applications, it also expects that DCE will help it build applications it can sell in its own industry.

"We do a lot of work in the area of open systems integration for oil field-related software," Laidley said. "We are a provider of an open software tool that we market to other oil firms. So we like to evaluate emerging technology, such as DCE, to include it in our environment."

Once Haliburton completes its interoperability tests, it plans to implement some applications on its Novell, Inc. NetWare and other local-area networking platforms, Laidley said.

"We are doing our architectural homework before any widespread implementation," he said. ◘

Videoconferencing to entice low-end users

continued from page 19

monitor, a System 4000 coder/decoder and keypad, three video and audio ports, an on-screen messaging capability and the ability to operate over 56K to 128K bit/sec digital lines. Users can also purchase features such as a video graphics capability, a larger monitor, encryption, windowing, multipoint bridging and operation above 128K bit/sec as options.

PictureTel's Model 200 system, which had been priced at $39,000 and is the next system in the family, comes standard with almost all of the Model 150's base and optional features.

"But the main functions are there at half the cost [in the Model 150]," Smith said.

Analysts said the new model should open up the videoconferencing market.

> "This price point should open up the market and enable smaller companies to benefit from the technology."
>
> ▲▲▲

"There was a definite problem in getting small to midsize businesses to adopt videoconferencing, especially in this difficult economy," said Sara Dickinson, a videoconferencing market analyst at Personal Technology Research, Inc. in Waltham, Mass. "This price point should open up the market and enable smaller companies to benefit from the technology."

PictureTel is also expected to announce that it is cutting the prices for its existing System 4000 models. A Model 200 with an average set of options had cost $44,000 and will now be priced at $34,000. The Model 400 plus options had cost $45,750 and will now cost $38,000. The Model 600 had cost $51,000 and will now cost $43,000, and the Model 800's price has been reduced from $54,000 to $48,000.

In addition, PictureTel is offering a three-year leasing program for the Model 150 that includes installation and maintenance and ranges in price from $500 per month for the base unit to $850 per month for a base unit plus options.

The Model 150 will be demonstrated at ComNet Washington, D.C. '93 and will be available March 1. ◘

AT&T SYSTIMAX® PDS is the communications superhighway to the future.

New software helps remote users access mainframe applications

By Michael Cooney
Senior Editor

RESTON, Va. — Remote PC and laptop users can now dial-up access to multiple mainframe applications simultaneously with new software from Software AG of North America, Inc.

The latest release of Network Parallel Application Sessions System (Net-PASS), Version 3.1, lets remote users access multiple mainframe applications concurrently without having to repeatedly log on and off or redial for each application.

Previously, Net-PASS required that personal computers be locally attached to the mainframe via a token-ring or Ethernet local-area net.

"Net-PASS will simplify how customers with many laptops or remote PCs work with multiple mainframe applications," said Joe Abusamra, product marketing manager for Net-Pass.

Net-PASS is a VTAM application that is used with the firm's 3270 Entire Connection terminal emulation and file transfer software running on remote PCs and laptops to let them forge asynchronous links to multiple mainframe applications.

Net-PASS acts like a traffic cop for incoming requests, passing them onto CICS, IMS, TSO or other mainframe-resident applications.

With Net-PASS on the mainframe and Entire Connection on the PC, users can have as many as 10 sessions with the mainframe and can cut and paste data between them.

Customizing access

Net-PASS 3.1 also lets users customize access to applications. For example, if order entry clerks always need access to only one CICS billing and one IMS customer information application, they can direct Net-PASS to bring those applications up automatically. With the previous version, users would have to go through multiple screens and logons every day to gain access to the same applications.

"Net-PASS eliminates many of the repetitive tasks operators have to go through," Abusamra said. "And since users don't have to repeatedly log on and off, it makes more efficient use of telephone lines."

New data compression code in Version 3.1 reduces the volume of transferred 3270 data by more than 50% over previous versions of Net-PASS, Abusamra said.

Net-PASS 3.1 will be available for MVS, MVS/XA and MVS/ESA in the first quarter. Pricing begins at $12,600. Entire Connection is available on OS/2 or Windows PCs for $500, or $3,000 for an eight-user license. It is also available on Macintosh PCs for $300, or $1,800 for an eight-user license. ◘

Tough times turning IBM attention

continued from page 19

to service," said Bob Jurczyk, information systems director for Mount Holyoke College in South Hadley, Mass. "Still, we haven't seen problems yet, and we really don't anticipate any."

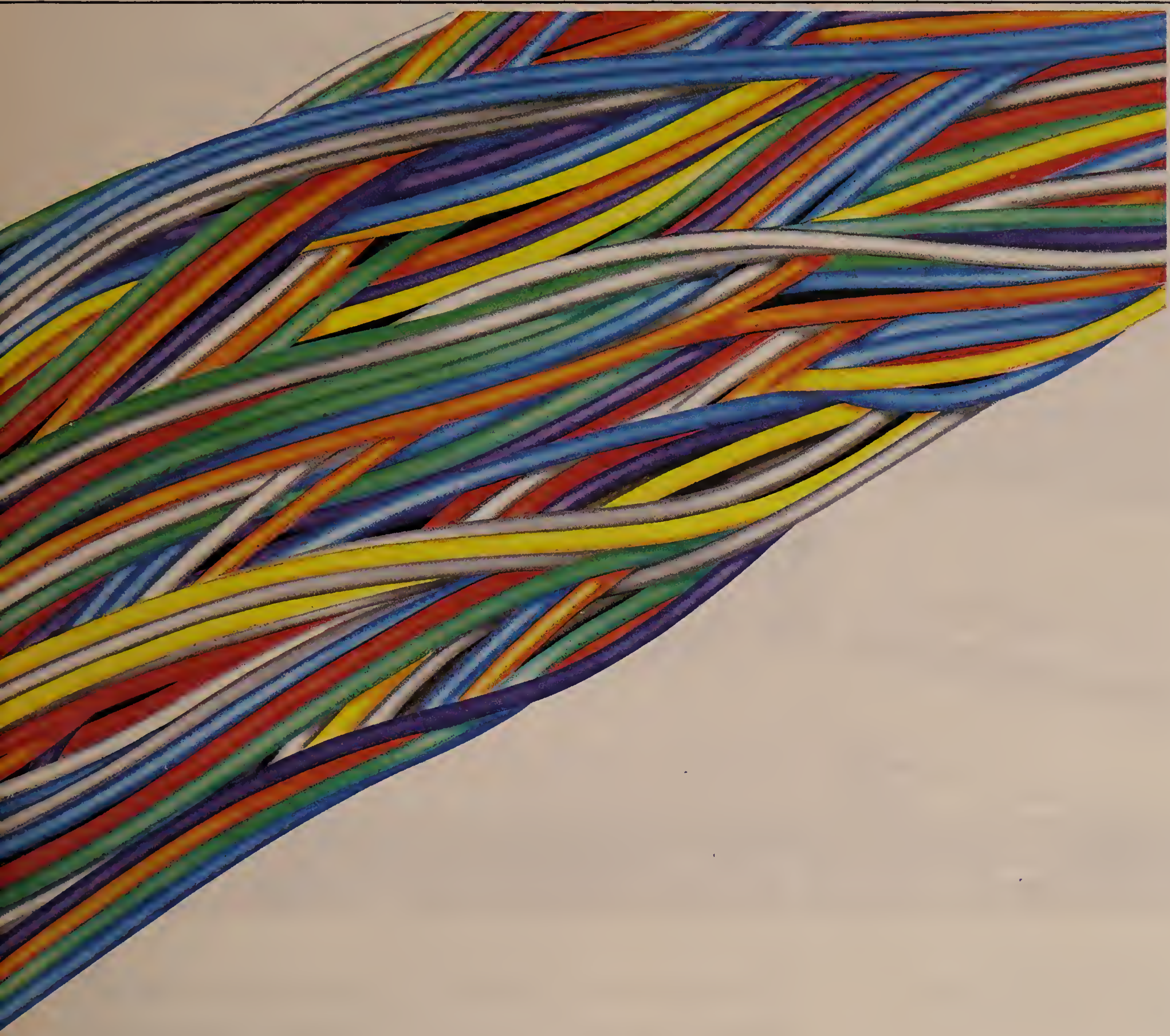
Jurczyk said IBM has made important networking advances in the past few years, such as increased support of Transmission Control Protocol/Internet Protocol, that it cannot afford to give up on now.

"Some of the cutbacks IBM is making now may have some effect on networking technology in five or six years, but we don't think anything drastic will happen soon," Jurczyk said.

Others think something drastic has already happened. "The old adage that picking IBM was safe for your career isn't true any more," said Tom Nolle, president of CIMI Corp., a consultancy in Voorhees, N.J. "There used to be a comfort level about picking IBM networking and hardware products, but there is real doubt now whether IBM can build the distributed computing environment of the future."

Nolle said if users continue to develop internetworks separate from their Systems Network Architecture nets, it will not matter how much money IBM puts into APPN or APPC development because users will not be using SNA equipment any more.

"IBM has to do a fast job of better positioning and marketing its products and services," Nolle said. "SNA and APPN are the only things holding the broken-up IBM business units together, and they are the only things users can point at to make their purchasing decisions credible." ◘



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Worth Noting

> "Until the past year, immature tools, the lack of software and limited hardware offerings kept client/server in the closet. Now Fortune 1,000 companies have the infrastructure in place to begin adopting the technology."
>
> **George Colony**
> President
> Forrester Research, Inc.
> Cambridge, Mass.

Netnotes

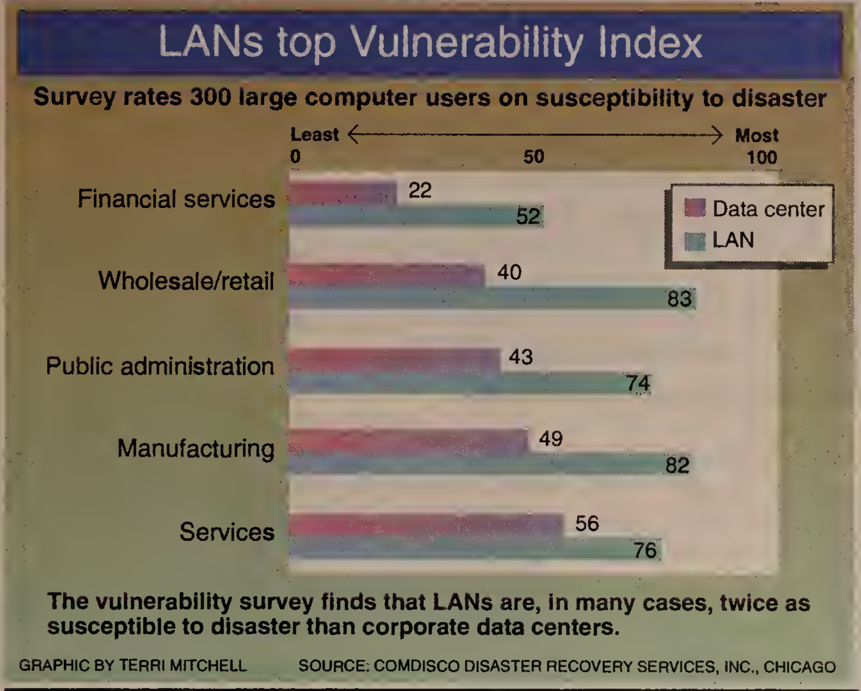
Webster Computer Corp. last week announced at MacWorld Expo/San Francisco that it has enhanced and unbundled NAServer Print Manager from NAServer Administrator and cut the combined price of the two products.

The software products are used for managing Digital Equipment Corp.'s Pathworks local-area networks from Microsoft Corp. Windows-based personal computers and Apple Computer, Inc. Macintoshes.

The company said making NAServer Print Manager V2.0 a stand-alone product gives Macintosh and Windows users point-and-click control of Pathworks print functions.

Licensing for NAServer Print Manager V2.0, due out this month, ranges from $400 for a single server supporting as many as 20 users to $3,040 for a server supporting an unlimited number of users.

NAServer Administrator, available now, costs $600 for up to 20 users and $4,550 for an unlimited number of users on a server. Contact Webster Computer in San Jose, Calif., at (800) 457-0903.



LANs top Vulnerability Index

Survey rates 300 large computer users on susceptibility to disaster

The vulnerability survey finds that LANs are, in many cases, twice as susceptible to disaster than corporate data centers.

GRAPHIC BY TERRI MITCHELL SOURCE: COMDISCO DISASTER RECOVERY SERVICES, INC., CHICAGO

Interenterprise LAN links represent next challenge

By Steve Simon
Special to Network World

Is it too soon to provide external customers, vendors and trading partners access to your client/server applications?

According to an Ernst & Young survey, the number of corporate local-area networks needing interenterprise communications will double between 1991 and 1994.

Although it is possible to use today's technology to extend client/server networks to other parties, as in the early days of LAN interconnection, the safety and amenities that make it comfortable are lacking.

> Your client/server architecture may not be be the same as that used by your customer.

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The first challenge begins at the workstation. Your client/server architecture may not be the same as that used by your customers. Your server may be NetWare, while they may only run a Network File System, VINES, AppleTalk, LAN Manager or LAN Server.

In theory, multiple network operating systems (NOS) can run concurrently. In reality, there are inconsistencies between architected protocol layers that can make this challenging. Generally, these obstacles can be overcome, but finding the source of the problem is complicated because it requires cooperation among your company, trading partners and multiple vendors.

Beyond NOS compatibility, there are connectivity challenges. You may be facing differences in LAN, bridge or router protocols. Most LANs are either token ring or Ethernet. There are many bridges and routers on the market that will convert between the two. In addition, there is an emerging bridging standard called source routing transparent (SRT). Bridges that implement SRT detect the type of LAN interface used and can natively bridge either Ethernet or token-ring messages without conversion.

But the problem is that bridges require like pairs to provide connectivity over a wide-area network. While there are standards for bridging between local LANs, no gains have been made in standardizing protocols between bridges connected over a WAN. This may force a customer to buy an additional bridge just to do business with your company, one they may not be able to operate or manage using their existing tools.

As an alternative, routers can be considered. Vendors have achieved router interoperability using standard line and routing protocols. However, this interoperability has mainly focused on Transmission Control Protocol/

(continued on page L2)

Architecture not the sole ATM question

While significant, Fore Systems says product availability, other issues are equally important.

By Robert Sansom
and Mark Juliano
Special to Network World

The authors argue the case for parallel bus-based ATM switches vs. the multistage architecture discussed in Nov. 16's LAN World. Sansom is executive vice-president and Juliano is director of product marketing at Fore Systems, Inc.

Asynchronous Transfer Mode (ATM) emerged in 1992 as the potential solution to a variety of networking problems. Advantages of ATM include support for multimedia communications, large-volume scalable bandwidth and seamless LAN/WAN internetworking.

Indeed, ATM is the only technology capable of delivering these benefits. Use of low-latency, high-capacity switches that support small, fixed-size cells and deliver guaranteed performance enable ATM networks to support integrated video, audio and data traffic. The ATM standard is the first technology supported across the computer and local- and wide-area network industries.

While some would suggest that the ATM switch architecture is the only issue to consider in ATM networking, there are a number of other critical issues, including the basic question about product availability. Few of the vendors that have announced plans to provide ATM products are actually delivering them today.

Other issues that need to be examined include:

- The ability to deliver complete end-to-end ATM networking.
- Interoperability with existing network media and protocols.
- Demonstrable interoperability between multiple ATM vendors.
- Network management for ATM networks.

Architecture question

A typical ATM network consists of at least one ATM switch. Each ATM switch connects both ATM end stations and other switches using point-to-point ATM links operating at one of the standard ATM data rates, such as 100M or 155M bit/sec. Typically, these end stations are either ATM-capable workstations or internetworking devices such as hubs and routers.

(continued on page L2)

Novell upgrades host and remote connectivity packs

By Caryn Gillooly
Senior Editor

SUNNYVALE, Calif. — Novell, Inc. last week added central administration capabilities to its NetWare for SAA host connectivity software and enhanced its NetWare Access Services remote connectivity software to include support for Windows applications.

Release 1.3 of NetWare for SAA includes support for IBM's LU 0, adds hardware connectivity options and, perhaps most importantly, provides administrators with centralized server configuration capabilities.

With the current version of the product, the network administrator must configure or reconfigure each NetWare for SAA server throughout an enterprise individually. With the new version, the administrator can distribute configuration information to multiple servers from a single site.

Although this capability will be useful for organizations with many NetWare for SAA servers at one site, it will likely be most helpful for branch offices that use NetWare for SAA to connect to a central host, Novell said.

According to users, the new

(continued on page L4)

3Com slashes FDDI prices to drive up desktop sales

By Skip MacAskill
Staff Writer

SANTA CLARA, Calif. — In an effort to make Fiber Distributed Data Interface a viable desktop connectivity option, 3Com Corp. last week unveiled a line of FDDI network interface cards that are priced up to 50% lower than rival adapters.

The FDDILink family of 32-bit Extended Industry Standard Architecture (EISA) adapter cards come in both fiber-optic and shielded twisted-pair versions. An unshielded twisted-pair model is being prepped for release when the FDDI-over-unshielded twisted-pair ANSI standard is finalized, which will most likely be before the second quarter of this year.

The adapters are designed with a plug-in media module, so if a user decides to upgrade from a shielded twisted-pair connection to a fiber one, the copper module is simply replaced with a fiber version.

This type of configuration saves space and avoids the heat buildup that sometimes results when daughterboards are added, which is an alternative upgrade method.

Achieving higher speeds

The adapters use a bus-mastering design and are driven by Motorola, Inc.'s FDDI chipset and 3Com's custom application-spe-

(continued on page L4)

DEC looks to tighten LAN integration

By Jim Duffy
Senior Editor

MAYNARD, Mass. — Digital Equipment Corp. is aiming future generations of its Pathworks network operating system at users needing tighter integration of their Novell, Inc., Apple Computer, Inc. and LAN Manager environments.

DEC is looking to provide integrated, "intuitive" management of a network comprising NetWare, AppleShare and LAN Manager local-area networks from a single Windows workstation. DEC also wants to provide seamless AppleShare, LAN Manager and NetWare file services from a single Pathworks server.

"We view this next generation of Pathworks as moving us into information integration," said Katrina Holman, DEC group manager of personal computer integration marketing.

DEC is expected to unveil a major new release of Pathworks midyear ("DEC plans a Pathworks make-over," *NW,* Dec. 28/Jan. 4). Without confirming dates, Holman said the new integration features will start to emerge this year. She also said integrated management and file sharing are key objectives for the next generation of Pathworks.

Under the management scenario, users will be able to automate the installation, configuration and operation of NetWare, Pathworks/LAN Manager and AppleShare clients and servers by clicking on icons with a mouse, Holman said. Pathworks is based on Microsoft's LAN Manager.

Previously, users had to administer these environments separately as if they were three different networks, rather than

(continued on page L17)

Architecture not sole question

continued from page L1

To deliver the guaranteed performance of ATM, each switch must be able to simultaneously support all of its connections at full bandwidth, a capability called nonblocking operation. For example, if a 16-port switch running at the Synchronous Optical Network (SONET) OC-3c rate of 155M bit/sec is to deliver guaranteed performance to users, it must have a 2.5G bit/sec nonblocking switch capacity.

Some vendors claim that only multistage switching architectures can provide this type of nonblocking capacity. While this can be argued for very large ATM switches in central-office environments supporting thousands of connections, this issue is considerably less relevant for ATM switches designed for computer network applications.

In LAN applications, ATM switches are usually deployed in wiring closets throughout a building or campus, and typically need to support four to 64 ATM connections. Cost-effective ATM switches of this size have been built using parallel bus-based switching architectures.

For example, Fore Systems' ForeRunner ASX-100 ATM LAN Switch, which is currently shipping, provides 2.5G bit/sec of nonblocking switch capacity for 16 155M bit/sec ports using a parallel 64-bit wide, contentionless bus-based architecture.

Cells enter the 2.5G bit/sec switching fabric from a variety of Network Modules and are carried across the parallel bus in preassigned time slots at a rate of 6 million cell/sec to any output port.

Parallel bus-based switches have two inherent benefits: integrated support for full-bandwidth multicast and broadcast, and support for multispeed ATM interfaces.

Full-bandwidth multicast is performed within the switch at no extra cost. Multistage switch architectures, on the other hand, require additional hardware to add cell copying capabilities.

The ability of parallel bus-based switches to easily accommodate different rate ATM connections stems from the use of time- division multiplexing (TDM).

Since a parallel bus uses the same TDM fabric for all traffic, a single ATM channel can use one or many time slots to accommodate high-speed ports. In comparison, a multistage switch architecture uses a single path through the switch for each fixed-speed channel. To provide higher-speed channels, multiple-individual paths need to be concurrently routed through the switch.

While this is feasible, it comes at the expense of complex path synchronization and produces the need for high-capacity, high-cost buffering.

For higher-capacity switches, parallel bus-based architectures can be expanded hierarchically with 10G to 40G bit/sec switching fabrics to support 64 to 256 simultaneous 155M bit/sec ATM connections in a single switch. This is accomplished by connecting a small number of individual

(continued on page L13)

Miramar debuts PC-based AppleShare file server

By Joanne Cummings
Senior Writer

SAN FRANCISCO — Miramar Systems, Inc. unveiled at last week's MacWorld Expo here a low-end AppleShare file server that can also act as a gateway to PC-based local-area networks.

MacLAN Connect Gold is software that lets a personal computer act as a file server in an AppleShare network, enabling users to utilize the more expensive Macintosh file server as a desktop machine on the LAN. In addition, its gateway functions let AppleShare users access files and services on a PC network.

The product comes with basic AppleShare file sharing and print server capabilities, including print spooling. It also offers users the ability to print to non-AppleTalk printers such as Hewlett-Packard Co.'s LaserJet II.

MacLAN Connect Gold is compliant with the Apple Filing Protocol (AFP), so Macintosh users can interact with the server using the standard Macintosh interface and access files via the Macintosh Chooser menu. The software offers links to several PC-based LANs, including Banyan Systems, Inc.'s VINES, Novell, Inc.'s NetWare, IBM's LAN Server, Microsoft Corp.'s LAN Manager, Ungermann-Bass, Inc.'s Net/One and Artisoft, Inc.'s LANtastic.

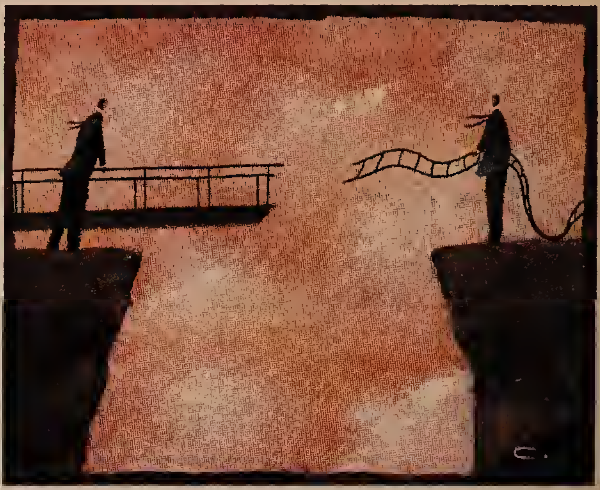
(continued on page L17)

LAN links next challenge

continued from page L1

Internet Protocol, meaning it is still difficult to get routers to cooperate over wide-area links using other protocols.

While there are several standards for line protocols, including frame relay and the Point-to-Point Protocol, multiprotocol routers lack standard interfaces, which would permit intervendor router communication, to Novell, Inc.'s Internetwork Packet Exchange (IPX), Digital Equipment Corp.'s DECnet, Xerox Corp.'s Xerox Network Systems, Apple Computer, Inc.'s AppleTalk or IBM's Systems Network Architecture. In most cases, intercorporate communication for these protocols requires use of routers from the same vendor.



Another question that comes up in extending client/server connectivity externally is security.

Security can be addressed at three levels: the application, the NOS and the network. Providing application security is the easiest to implement but is the most difficult to administer in a large network.

It is not unusual for mission-critical applications to include a piece of security code. Many database applications, for example, typically include levels of access security.

However, like trying to secure your house by putting locks on all the rooms, you end up with an unmanageable number of database security systems.

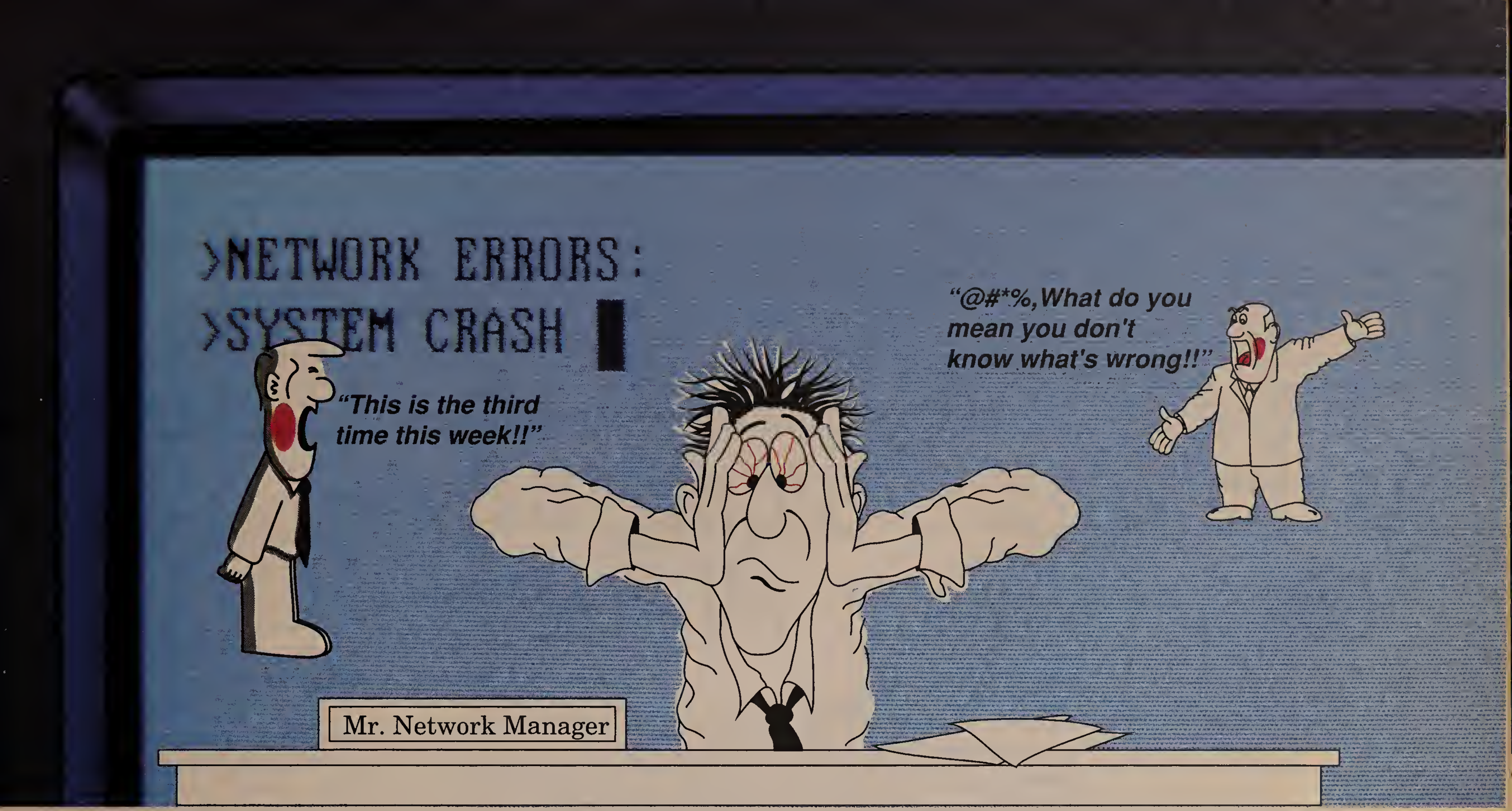
NOS security can protect a single workstation or a cluster of workstations and servers. For example, with NetWare, a user's access to various resources is limited by a profile. Profiles can be used to authorize access to one or more servers, printers, directories and files in the network.

The OS/2 LAN Requester program requires users to log on to a domain server before accessing other network resources. This server protects all other servers in its domain and communicates with other domains' servers to coordinate security.

But there are limitations to using NOS security alone. There may be other kinds of NOS resources on your network not protected by security, and not all servers on your LAN use a NOS that provides security. If security is not centrally administered, it may be more lax on less critical components on the network, but these resources are just as susceptible to viruses.

In addition, your company may not want unauthorized access to its network transport. NOS security would not prevent this. Unauthorized network access could result in someone

(continued on page L16)


>NETWORK ERRORS:
>SYSTEM CRASH
"This is the third time this week!!"
"@#*%,What do you mean you don't know what's wrong!!"
Mr. Network Manager

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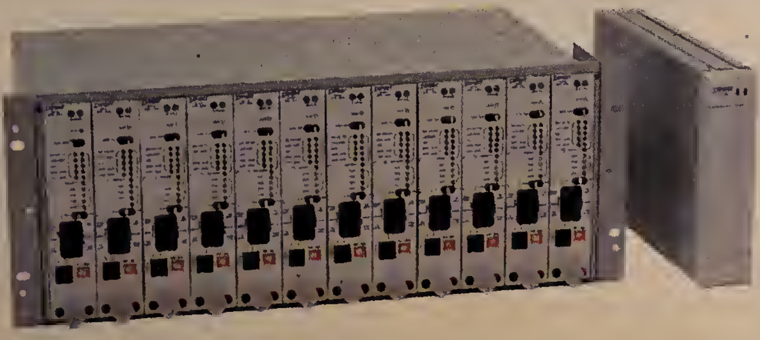
The 2000 does more than just monitor network condition. It also allows you to locate and diagnosis the problem. Multiple loopbacks and activation codes allow sectionalization of the entire span, making problem location simple.

Now you have all the data you need to guarantee performance, reliability, and service...before it's too late!



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Circle Reader Service #23

Novell upgrades connectivity packs

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capabilities can also serve other purposes.

"Connectivity between our NetWare network and IBM hosts is strategic to our [information systems] plans," said Matthew Moran, a systems analyst for the county of Santa Barbara, Calif. "The enhanced server configuration capabilities allow us to test different server configurations" more quickly and easily.

On the hardware side, NetWare for SAA 1.3 supports Ethernet host connections, whereas the previous version only supported token ring. Version 1.3 also now supports any Novell-certified Open Data Link Interface-compliant token-ring or Ethernet network adapter card.

The new version supports applications using IBM's LU 0 program interface, which is used with custom-tailored applications such as many host-based financial and banking programs. Previously, NetWare for SAA supported only IBM's LU 6.2.

Novell also brought out NetWare Access Services 1.3, a remote communications package that now supports Microsoft Corp. Windows applications and shared modem access.

The new version lets as many as 16 remote users dial into a NetWare network and run multiple server-resident Windows applications concurrently. Only screen information, key strokes and mouse signals are sent over telephone lines, as opposed to all the application code. This lets the Windows application appear and perform as if it were on the local processor.

Remote users can also now access the NetWare Access Services server by dialing into the same modems employed by a NetWare Asynchronous Communications Services (NACS) 3.0 server. NACS is a NetWare Loadable Module that adds remote communications services to a NetWare 3.11 server. Previously, a dedicated modem was required to dial into a NetWare Access Services server.

Both new versions are available now. NetWare for SAA comes in several configurations, ranging in price from $1,995 for a 16-session version to $14,995 for a 254-session version. NetWare Access Services costs $2,395. ◘

3Com slashes FDDI card prices

continued from page L2

cific integrated circuit.

"The FDDILink adapters can do remote [direct memory access] transfers across the bus without using a processor and actually achieve speeds 7% to 10% faster than processor designs," said George Prodan, product line manager of high-speed technology at 3Com.

The FDDILink line supports the IBM-driven Shielded Distributed Data Interface copper standard as well as ANSI's "green book" specification. Additionally, the adapters not only meet the Federal Communications Commission's Class A emission standards, but also the more stringent Class B requirements.

> "The only high-speed technology you can actually purchase and install today that's based on a standard is FDDI, and there are over 36 vendors supporting it."
>
> ▲▲▲

More to come

3Com is actively supporting and developing other high-speed technologies, such as Asynchronous Transfer Mode and 100M bit/sec Ethernet, but Prodan pointed out that FDDI is available now.

"The only high-speed technology that you can actually purchase and install today that's based on a standard is FDDI, and there are over 36 vendors currently supporting it with interoperable products," he said. "We're working with other technologies, but FDDI offers the high performance, built-in fault tolerance and network management that users are asking for now at the desktop."

The shielded twisted-pair and fiber FDDILink adapters are available now and are priced at $1,295 and $1,895, respectively.

The shielded twisted-pair media modules cost $150 each, while the fiber versions are tagged at $750.

Pricing for both the unshielded twisted-pair adapters and media modules will be available when those products are announced later this year. ◘

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Circle Reader Service #36

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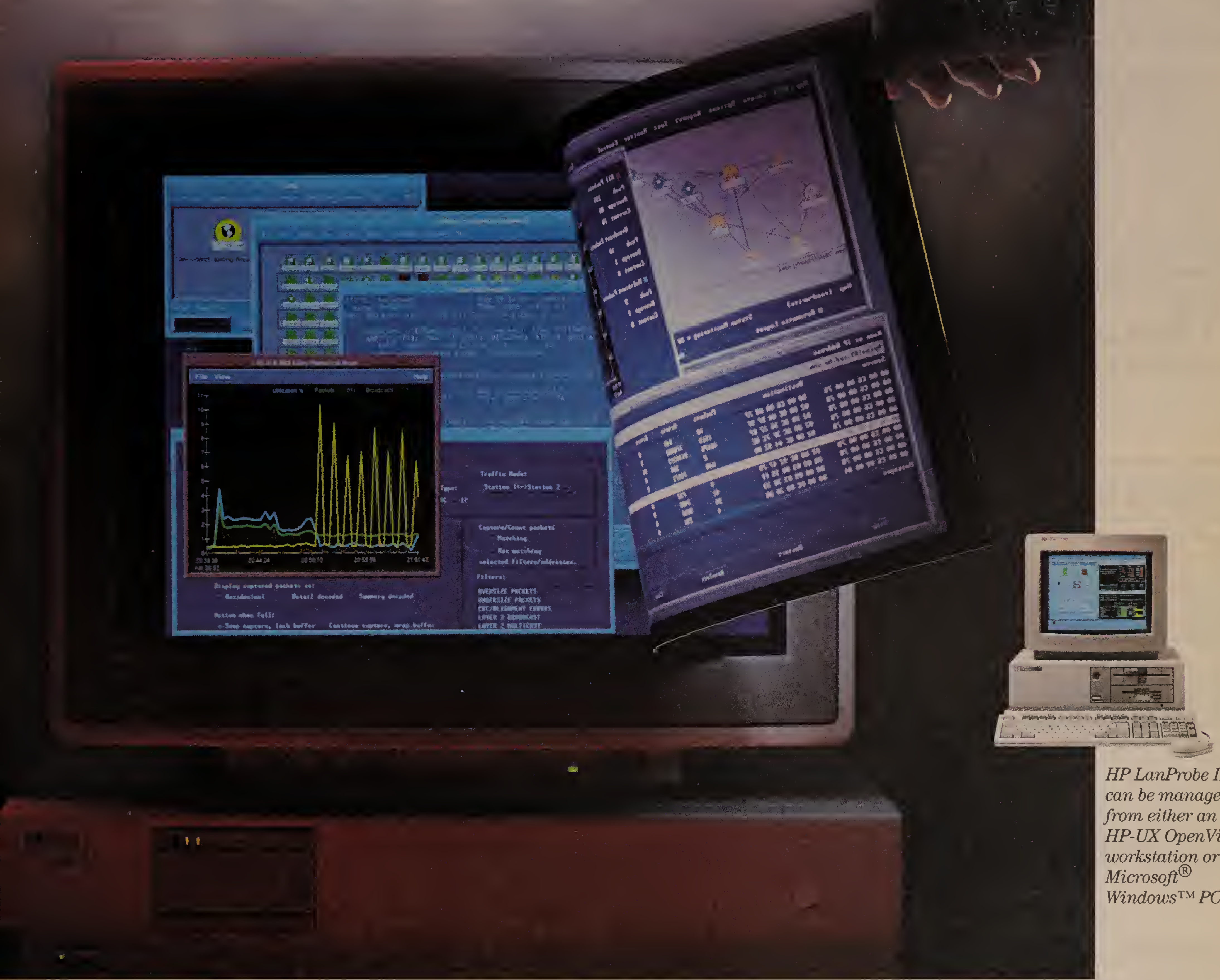

HP LanProbe II can be managed from either an HP-UX OpenView workstation or a Microsoft® Windows™ PC.

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Swelling ranks of NLMs give NetWare advantage

NetWorth provides list of available NLM options.

By Caryn Gillooly
Senior Editor

One of the keys to the success of Novell, Inc.'s NetWare local-area network operating system (NOS) is the use of NetWare Loadable Modules (NLM).

NetWare 3.X and the forthcoming 4.0 version are modular, meaning value-added network services, server-based applications and server utilities can be tacked onto the core NOS in the form of NLMs as needed. This enables network clients to access services through the server.

> One advantage of NLMs is that they can be installed on a NetWare server while it is running.
>
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NLMs are generally written and sold by third parties, although Novell does offer a number of its own. They are built using a set of NetWare-specific interfaces, providing a way to tightly couple the programs to the operating system, enhancing program performance, as opposed to simply running a program above NetWare.

As evident from the accompanying chart, a wide range of modules are available, providing everything from system backup management to routing. Some of these NLMs have been certified by Novell as being compatible with NetWare, while others are still waiting to be certified, and still others may never be offered up for certification.

Certified NLMs are identified in the chart below, which was compiled by NetWorth, Inc. of Irving, Texas. The chart is broken down by function and lists the provider, the product name, a brief product description, availability and pricing.

Besides performance and modularity, one advantage of NLMs is that they can be installed on a NetWare server while it is running and users are on line. Administrators do not have to bring down the server in order to load the software — as is required with many other applications — and NetWare users are not interrupted if a new NLM is added.

This is the primary difference between an NLM and a value-added process (VAP), another software-based add-on program for NetWare systems. VAPs are used in NetWare 2.X environments only and require that the server be taken down before they can be loaded.

Once loaded, the NLMs are treated as part of the NOS itself and are provided the same privileges as the core network operating system. In other words, the NLMs run at the same hardware level.

> The Ring 0 vs. Ring 3 debate has been long standing between Novell and Microsoft.
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At the core of things

The core of the NetWare NOS operates at what is called Ring 0 on the server, meaning it has direct access to the hardware. All applications that are not NLMs operate at Ring 3 on the server — which is two rings away from direct access to the system hardware. This means that if the application is somehow corrupted, it will not affect the operation of the primary operating system and will not crash the entire LAN.

However, programs running at Ring 3 run slower than those implemented at Ring 0 because the latter has direct access to the hardware. This is one of the reasons why Novell chose to allow NLMs also to run at Ring 0.

The Ring 0 vs. Ring 3 debate has been long standing between Novell and Microsoft Corp. Microsoft has long claimed that NetWare has no protection from poorly written NLMs; therefore, it is not as secure as LAN Manager, which does not allow third-party applications to run on the same level as its core NOS.

That debate will end with the pending release of NetWare 4.0, which will give administrators the choice of running NLM applications at either level. ☐

NetWorth's list of industry NLMs

(An overview of software services available for NetWare V.3.11 servers)

NetWorth, Inc. has compiled a comprehensive database of NetWare Loadable Modules (NLM), which it has agreed to allow *Network World* to publish on a semi-annual basis as an industry service.

Dallas-based NetWorth makes the NetWare Applications Engine (NAE), a 486DX-based application server module for its Series 4000 LAN hub that can be delivered with NetWare Runtime preinstalled. The NAE adds flexibility to network design by enabling administrators to dedicate servers to file and print services while offloading additional NLM-based network services to the NAE.

The company created the database to help customers identify useful NLMs -- only some of which have been certifitied by Novell, Inc. (as noted in the chart). NetWorth updates the database regularly and will distribute updates free to anyone who requests them. Contact NetWorth at 8404 Esters Rd., Irving, Texas 75063, or call (800) 544-5255.

Vendor	Product name	Description	Availability and pricing
Accounting software			
Solomon Software (800) 879-2767 x783 (419) 423-3688	Solomon III Accounting V.8.0b	Solomon III Accounting Software's NLM Network System Manager eliminates the need for a dedicated database server. It supports large databases and a significant performance gain can be obtained when the NLM System Manager is running the Solomon database server task. Solomon Software is a general accounting software product.	Expected Delivery Dec. '92. 3 users - $1295. Addn'l packages of 3 - $795. Addn'l packages of 10 users - $2500.
Backup and Storage Systems			
Cheyenne Software (800) 243-9462 (516) 484-5110	ARCserver V.4.0	(Certified 6/92.) Fully integrated data management. Provides continuous backup and restore capabilities to a wide range of local hard disk, optical or tape devices. Includes AutoPilot Tape Management and fully automated disk grooming and disaster recovery capabilities. (Certified versions: ARC-serve 2/91; V.3.0b - 9/91; V.4.0 - 4/92.) Also available as a VAP.	Shipping. 5, 20, 50, 100 users for $395, $1195, $1495, $1895.
FortuNet (800) 959-0718	NSure V.1.2	A PC LAN Backup/Restore application. Hardware independent, NSure supports a wide range of hardware including 8mm, 4mm, QIC, optical and autochangers. Uses powerful features such as data encryption, tree select, volume/session, database, open file backup and delete after backup.	Shipping. 1, 5 and 5+ and unlimited server for $195, $595, $795 and $995.
Netwave, Inc. (212) 242-3200	LANshadow V.3.31	LANshadow is a full time server backup utility. It can maintain a duplicate "shadow" server that is accessed by users if the primary server fails. LANshadow can be configured to shadow one or many file servers.	Shipping. $795 per backup server.
Legato Systems, Inc. (415) 329-7880	NetWorker, NetWare Version Release 2.1	(Certified 10/92.) NetWorker is a software product that provides data backup, recovery and management services for NetWare, Unix and many other network operating systems. Offers mainframe-like storage management techniques with client/server network technology, providing powerful, interoperable, easy to manage backup.	Shipping. 10, 100 and 250 users for $740, $2500 and $4000.
GigaTrend, Inc. (619) 931-9122 x300	MasterSafe Enterprise	System-based backup. The NLM can be loaded on all V.3.11 servers. Also backs up workstations and NetWare 286 servers. Uses the SMS library to backup DOS, OS/2, Mac and Unix files. Scripting language ets users determine date and time and attended or unattended mode. Certification in Progress.	Shipping. ISA, $3395; MCA , $3695; EISA , $3795.
	MasterSafe NLM	For one to four servers environments which may not need the advanced capabilities of MasterSafe Enterprise. Uses the NLM to backup one file server at a time. Also backs up workstations and NetWare 286 file servers. Certification in Progress.	Shipping. ISA , $1895; MCA , $2195; EISA, $2295.
Maynard Electronic (800) BAC-KUP1 (407) 263-3500	MaynStream NLM V.3.1	(Certified 5/92.) Performs backup operations for all servers and DOS workstations on the network. Features include: advanced file selection, automatic backup, common tape format, comprehensive log files, multiple backup methods, etc. Capacities range from 250M bytes to 50G bytes.	Shipping. Included with the price of drive.
Tallgrass Technologies Corp. (800) 825-4727 (913) 492-6002	NetSecure	Fully integrated data management, provides continuous backup and restore capabilities. Includes AutoPilot Tape Management and fully automated disk grooming and disaster recovery capabilities. Will also backup SCO Unix, OS/2 and Macintosh files with the purchase of additional client agents.	Shipping. $1895, unlimited users (other configurations available).
Palindrome (708) 505-3300	Network Archivist NLM	Maintains all the same features as the DOS-based Network Archivist, including relational database tracking of files and file histories, safe file migration and automated tape management and scheduling. Typical restore speed is 15-30M bytes per minute (up to 90M bytes under controlled testing). Certification in progress. Protects NetWare 2.X servers via the network.	Shipping. $1295 per installation.
Integra Tech. (408) 980-1371	OASAS I V.03.00.29	OASAS I creates and manages RAID Level 5 disk array subsystems under the control of NetWare 3.11. Offering configuration flexibility and resource utilization, OASAS I is compatible with the SCSI protocol, EISA, ISA and MC buses and most SCSI disk drives.	Shipping. $795 per server.
Tecmar, Inc. (800) 624-8560 (216) 349-0600	ProServe	(Certified 2/91.) Supports hierarchical data storage, letting network managers store information on different media according to its importance. It can also create, label and manage tapes automatically. Includes an Auto Pilot Tape Management feature. VAP support also available.	Shipping. Bundled solutions with different capabilities.
Vortex Systems (412) 322-7820	TC376 Storage Management System	(Certified 12/91.) Performs continuous backup, automatically and transparently, including open files. Protects against primary disk crashes by allowing the server to continue running as if nothing had happened. The product is both a hardware unit and software.	Shipping. $3,495 per server.
CD ROM			
Corel Systems Corp. (800) 836-SCSI (613) 728-8200	CorelSCSI V.1.01F	(Certified 9/25/92.) The CorelSCSI software for NetWare 386 provides transparent support for virtually every WORM, rewritable, CD-ROM, multi-function drive and optical disk jukebox on the market. CorelSCSI allows users on the network to access CD-ROM drives on the server from their workstations.	Shipping. $99 per server.
Meridian Data, Inc. (800) 767-2537 (408) 438-3100	CD Net for NetWare V.4.30	(NLM Certified 9/92.) CD Net for NetWare is a high-performance NLM for multi-user access and retrieval of CD ROM information over Novell V.3.11 LANs. It offers DOS and Windows client software installation over the network, customized menus and intelligent administrative tools.	Shipping. 10, 100 and 250 users for $645, $1295, $1995.

Vendor	Product name	Description	Availability and pricing
CD ROM			
Online Computer Systems, Inc. (800) 922-9204 (301) 428-3700	Opti-Net NLM Version V.1.0	The OPTI-NET NLM allows you to add CD-ROM drives directly to a NetWare V.3.X file server and run OPTI-NET as an NLM. Includes performance features such as SCSI Bus disconnect/reconnect for simultaneous device access and CD-ROM server remote network management features. Also available as a VAP.	Shipping. $1495 for 100 users.
Micro Design Intn'l (407) 677-8333	SCSI Express V.1.2.0	(SCSI Express is Novell certified) SCSI Express for NetWare 386 provides access to transparent mass storage. This is a package of device drivers containing support for CD-ROM, hard disks, host adapters, rewritable optical and WORM drives. With the purchase of a jukebox, transparent jukebox support is also supplied. Also available as a VAP.	Shipping. $795 per server.
Client services			
Novell, Inc. (800) NETWARE	NetWare FLeX/IP V.1.2	A set of TCP/IP utilities providing connectivity, a bi-directional print gateway and file transfer capabilities between Unix systems and NetWare 3.11 environments. Also allows for remote management of NetWare 3.11 servers from an X Window System.	Shipping. $1,995 per server.
	NetWare FTAM V.1.2	Permits a variety of OSI FTAM clients to access the NetWare V.3.11 file system and enables NetWare DOS workstation users to attach to OSI networks and communicate with FTAM.	Shipping. $4,995 per server.
	NetWare for Macintosh V.3.01	Provides NetWare file, print, routing and administrative utilities to the Macintosh. It integrates Macintosh users into the NetWare V.3.11 environment, offering those benefits that DOS, Windows and OS/2 users enjoy.	Shipping. 5, 20, 100, 200 users for $1195 - $2,995.
	NetWare NFS V.1.2	Integrates Unix systems with NetWare V.3.11 file systems and resources to give Unix users access to the NetWare environment from their native OS. NFS clients can share files, printers and other network resources with other DOS, Windows, OS/2 and Macintosh users.	Shipping. 1-5 servers for $4,995 - $14,995.
Communications			
Asynchronous communication services			
Newport Systems Solutions, Inc. (800) 368-6533 (714) 752-1511	ACI, Asynchronous Communications Interface V.1.14	(Certified as an AIO Driver 7/92.) Conforms to NetWare's AIO interface. AIOACI.NLM with NSS' ANIC adapter provides asynchronous communications over eight ports at all speeds up to 38.4 Kbps. Supports any NetWare 3.X application that conforms to the NetWare AIO interface (e.g. NetWare Global Messaging and NetWare Async. Comm. Services).	Shipping. $1195 - includes adapter card and software.
Novell, Inc. (800) NETWARE	NetWare Asynchronous Communication Services (NACS) V.3.0	Allows network supervisors to pool asynchronous modems so they can be shared for a variety of communication tasks instead of dedicating modem and phone lines to each user. NACS works with a large number of third-party applications and terminal emulation packages.	Shipping. 2, 8, 16 and 32 port licenses for $595, $1795, $2995 and, $4995.
Newport Systems Solutions, Inc. (800) 368-6533 (714) 752-1511	XCI, X.25 Communications Interface V.1.00a	Provides X.25 access for multiple NetWare platforms: NAS V.1.2, NetWare for SAA V.1.3 and NACS V.3.0. XCI supports up to 138 virtual circuits on two physical ports at speeds from 1.2K to 384 K bits/sec. XCM, XCI's X.25 engine, has been NET certified for Levels 1 and 2. XCI is NetWare tested and approved. Certification in Progress.	Shipping. $2195 - includes adapter card and software.
Fax services			
Cheyenne Software (800) 243-9462 (516) 484-5110	FAXserve V.1.0	A server-based NLM application that provides secure, easy-to-use and cost efficient facsimile services for your Novell network operating system.	Shipping. $995 per server.
Host access			
Tangram Systems (919) 851-6000	AM:PM for NetWare 3.2.1	IBM host-to-NetWare LAN data and software distribution product. Works in conjunction with NetWare for SAA V.1.2 to enable data and software distribution from IBM hosts to clients on the NetWare LAN.	Shipping. $15,000 for unlimited users.
NetWise, Inc. (800) 733-7722 (303) 442-8280	DUET RPC Transport Technology	Allows clients and servers developed with RPC TOOL and RPC EXEC to communicate across different network protocols. Applications can function in a multiprotocol internetwork without requiring the same protocol on each end. DUET supports TCP/IP, SPX/IPX and SNA (APPC/LU6.2). Certification in progress with Novell.	Shipping. (Prices vary-- please phone.)
Novell, Inc. (800) NETWARE	NetWare for SAA V.1.2	Provides workstations with IBM mainframe and AS/400 host connectivity. Support for DOS, Windows, Macintosh, OS/2 and Unix users is available with access to up to 506 display, printer and APPC sessions on multiple hosts simultaneously.	Shipping. 16, 64, 128 and 256 sessions for $1995, $5995, $8495 and $14,995.
Firefox Communications (206) 827-9066	NOVIX for NetWare	Enables NetWare client PC workstations to access Unix and other hosts supporting TCP/IP protocol with applications such as Telnet, FTP and industry standard API's through communications services in a NetWare server. Also available as a VAP.	Shipping. 5,10,20,40,60,80 and 100 users for $700-$6200.
	NOVOS for NetWare	NetWare-to-OSI host communications system incorporating ISO open systems communications protocols. Supports workstation programs for communication to ICL VME mainframe systems over OSI transport protocols and communication to Unix host systems over OSI transport protocols. Also available as a VAP.	Shipping.
Wireless			
Johnston Technical Services (214) 247-5021	SpreadNet Level II	The SpreadNet Wireless Network Link provides wireless Ethernet connectivity for distances up to 20 miles at data rates of 900K bit/sec. SpreadNet supports multiple protocols (TCP/IP, Novell, AppleTalk) simultaneously.	Shipping. Short range, $16,000; long range, $19,000 per network site.
Database			
Extended Systems (406) 587-9170 (800) 235-7576	ExtendBase V.1.2	Brings the performance advantages of client/server technology to dBASE III, dBASE IV and clipper users. Builds indexes, processes queries and generates reports much faster than traditional dBASE or clipper, say company officials.	Shipping. $595 per server.
Micro Data Base System, Inc. (MDBS) (317) 447-1122 (800) 445-6327	MDBS IV V.4.3	A high performance OLTP database management system designed for applications involving complex data relationships and massive amounts of data. Its client server technology supports a wide variety of networks including NETBIOS, LAN Manager, Novell, TCP/IP and DECnet. Supports up to 4G bytes files and features processing, fault tolerance abortable transactions and transaction logging capabilities.	Shipping. Pricing starts at $7,000 for base module.
Novell, Inc. (800) NETWARE	NetWare SQL V.3.0	(Certified 5/92; Bulletin #N18) Distributed, relational database environment allowing many applications to share data from Btrieve database environments. Supports a variety of popular decision support applications, including spreadsheets, query tools, report writers and application development tools. Also available as a VAP.	Shipping. 5, 10, 20, 50, 100 and 250 users for $795 - $10,995.
Oracle Corp. (415) 506-7000 (800) ORACLE-1	Oracle Server for NetWare V.1.1	(Certified 3/92 and 11/92) Enables applications developers to build high performance client-server database systems for Novell networks. Contains the same Oracle Relational Database Management System, which runs identically on more than 85 different hardware platforms.	Shipping. Client-based pricing starts at $3,999 for 8 clients.
Progress Software (617) 275-4500	Progress 4GL/RDBMS v6.0 (NLM version)	An integrated application develpment environment composed of a fourth-generation language and a relational database management system. Progress runs on a wide range of computing platforms and supports an equally broad range of operating systems.	Shipping. 5, 16, 32, 48, 64, 96, 128 and 172 users for $850 - $10,003.
Quadbase Systems (408) 738-6989	Quadbase-Server/ NLM V.2.0	An SQL relational database server for mission-critical applications. Advanced features and query optimization techniques make it especially attractive for large amounts of data. Unique support of dBASE data make it especially appealing for xBase applications. Client applications can be run from DOS or Windows.	Announced. Shipping mid-1993.
Gupta Technologies (800) 876-3267 (415) 321-9500	SQLGateway/ APPC (NLM) V.3.0.0	Provides client-server SQL connectivity from PC workstation clients to IBM mainframe DB2 DBMS. Works in conjunction with Gupta SQLHost.	Shipping. $4,995 per server.
	Gupta SQLBase Server for NetWare V.5.1	(Certified 7/92) Gupta SQLBase Server for NetWare is the high performance database server for Novell networks and is optimized to work with graphical front-end applications. Compliant with many standards, including ANSI SQL Level 2 with Integrity addendum.	Shipping. 5, 20 and unlimited users for $995, $3995 and $7995.
Sybase, Inc. (510) 596-3500 (800) 854-2273	SQL Server for NetWare 4.2	(Certified 6/92) Relational database management system that integrates dissimilar applications and data sources for real-time decision support systems. The Sybase NLM includes the entire feature set of the Unix, OS/2 and VAX/VMS editions and supports both TCP/IP and IPX/SPX protocols.	Shipping. 1, 8, 16, 32 and unlimited users for $995 - $29,995.
Imaging			
Wang (800) 835-9264	Open/image for NetWare	Software package that provides distributed image services. The NLMs contain interfaces to client applications to provide concurrent image file access, document management and image printing. Fully integrated with NetWare services and facilities so that no specialized interfaces are needed.	Shipping.
Compulink Management Center (310) 212-5465	LaserFiche NLM/ Windows	Features a client-server structure specifically designed for NetWare that gives users faster full-text searches and retrieval, quicker indexing and greater data management capability. The product was designed in anticipation of NetWare V.4.0 with the Novell-Kodak Image-Enabled API to offer users use of their network for imaging applications.	Announced. Shipping 1Q '93.
Messaging			
Novell, Inc. (800) NETWARE	NetWare Global Messaging	Provides store-and-forward messaging transport and directory synchronization across multiprotocol networks. Supports MHS standard connectivity used by most network-based messaging systems.	Shipping. 20, 50, 100, 250 and 1000 users for $495, $895, $1495, $2695 and $7495.
	SMTP Protocol Module	Simple Mail Transfer Protocol module enables NetWare Global Messaging users to exchange messages with Unix and other TCP/IP host users. It uses the TCP/IP transport service built into NetWare V.3.11.	Shipping. Unlimited users for $2995.
	X.400 Protocol Access Module	The X.400 Protocol Access Module will be available for OEMs, enabling them to provide complete X.400 solutions for the NetWare platform, which fully integrate with NetWare Global Messaging.	OEM product; Will ship first from Retix in 1Q93 for $6995.
	SNADS Protocol Module	The SNADs Protocol Module allows a NetWare Global Messaging server to exchange messages with IBM's Distributed Office Support System and with users of IBM's OfficeVision/MVS and OfficeVision/400. It employs a single NetWare for SAA session for SNA transport services.	Shipping. 20 and unlimited users or $2495 and $6995.

THE TECHNOLOGY S
a Fon
If you were installing 5000 retail technology centers, which premises wiring system would you want?

Radio Shack chose AMP.

Tandy Corporation has an ambitious goal: build/remodel their chain of 5000 Radio Shack stores, at a clip of 400 to 500 a year. To keep on schedule, they needed a real advantage. And they've specified key elements of the AMP NETCONNECT Open Wiring System to get it.

The modular NETCONNECT system provides them with uniform wiring throughout the nationwide chain of stores. Not surprisingly, the wiring closely resembles a network installation–

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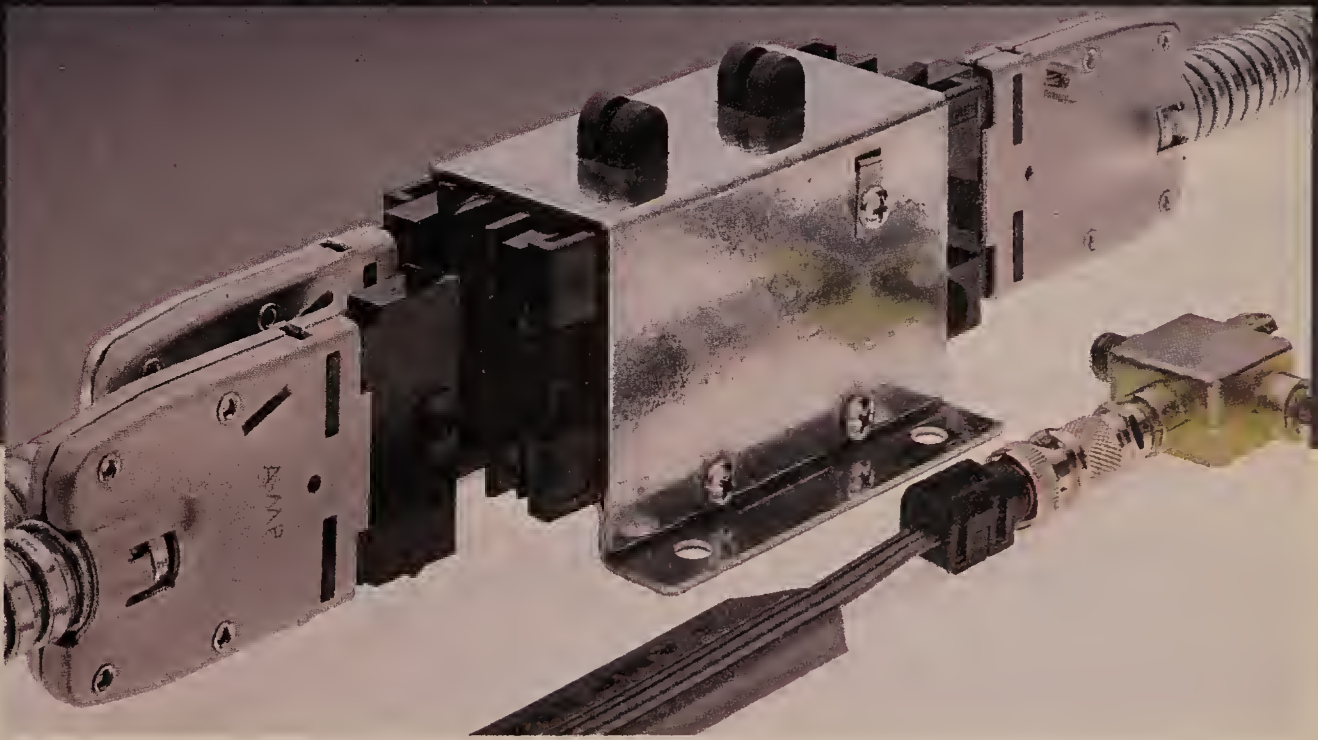
Circle Reader Service #33



AMP INNERGY modular power system speeds installation. Undercarpet coax cable simplifies wiring of displays.

delivering power, coax, and twisted pair cabling in wall systems of Tandy's own design. Undercarpet cabling carries the same services to free-standing display "cubes".

The good news for Tandy comes as complete wiring system kits are delivered to a site: it takes a four-man crew less than four hours to fully wire a store. Along with fast installation, all NETCONNECT products are engineered for high performance, simplified changes, and easy transition to new technologies.

The AMP NETCONNECT system helps Tandy meet difficult goals: fast installation, and premises wiring that can keep pace with their business–the business of technology.

For more information about the AMP NETCONNECT Open Wiring System, call 1-800-522-6752 (fax 717-986-7575). AMP Incorporated, Harrisburg, PA 17105-3608. In Canada, call 416-475-6222.

THIS IS AMP TODAY.

AMP

Vendor	Product name	Description	Availability and pricing
Network management			
Application metering			
Funk Software (800) 822-3865 (617) 497-6339	AppMeter V.1.0	Keeps track of all network application usage and lets you quickly create a nuM byteser of useful reports. AppMeter also has virus protection built in, verifying each application whenever it runs. Also available as a VAP.	Shipping. $595, server-based.
Blue Lance, Inc. (713) 680-1187	LT Auditor 4.0	An audit trail that incorporates NLM functionality, software metering and hardware inventory modules into one advanced, yet simple and easy-to-use package. LT auditor tells who accessed your network, made bindery changes or manipulated files by user name, station address, date and time. Also available as a VAP.	Shipping. 1 user for $695; 10 users for $595 each.
Brightwork Development (908) 530-0440 (800) 552-9876	SiteLock V.3.2	SiteLock meters and monitors software use so you can be sure that you aren't exceeding the nuM byteser of purchased licenses. SiteLock also protects your NetWare LAN against virus infections.	Shipping. $495 per server.
Directory services			
Novell, Inc. (800) NETWARE	NetWare Name Service (NNS)	Enables NetWare users to access resources on multiple servers with a single login. Simplifies the task of maintaining a consistent user environment and offers transparent, easy access to computing resources, no matter where those resources are located on the network. (This product will be replaced with Novell's Directory Services for future releases of NetWare, beginning with Release 4.0.)	Shipping. $1995 per company license.
Banyan Systems, Inc. (800) 828-2404 (508) 898-1000	ENS for NetWare	Enterprise Network Services makes the VINES StreetTalk Directory, security and management services available for NetWare. The services run on a dedicated VINES 5.0 server while an NLM and VAP provide the hooks into NetWare 3.X and 2X.	Expected this month. Prices vary by configuration, ranging from 5 users for $295 to250 users for $3495.
Disk management			
Knozall System (800) 333-8698 (602) 545-0006	FileWizard V.2.12	FileWizard is a Novell server space management tool that shows the who, when and how much of server space. Reports in graphical and tabular form. Nine actions for each file range from notifying user, archive or delete, automate space management. Also available as client application.	Shipping. 1, 3 and 8 users for $495, $695 and $1095.
Hub management			
NetWorth (214) 929-1700 (800) 544-5255	EtherManager V.3.0	Provides total LAN management by gathering IPX statistics from workstations, servers, bridges, routers, printers and NetWorth concentrators. Provides the same look and feel of standard NetWare utilities and supports automatic remote paging. Also available as a VAP.	Shipping. 4 users for $1995.
Novell, Inc. (800) NETWARE	NetWare Hub Services	Integrates hubs with NetWare servers. Hub cards acting as the wiring center for the LAN are installed in the NetWare server and NetWare Hub Services is used to monitor and manage network port traffic. An SNMP agent is provided for remote management.	Shipping. $250 per server.
Miscellaneous network management tools			
C-Note Software (800) 489-0090	Cadence	Cadence Network Time Synchronizer solves your PC network clock problems. This includes the daylight savings time adjustment and the hundreds of other problems you've probably experienced. Unattended, Cadence calls a nationwide time service and synchronizes your server clock to the most accurate clocks in the world.	Shipping. $99 per server.
Compaq Computer (800) 345-1518 (713) 378-8820	Compaq Server Manager/R	(Certified 12/92) Provides remote management console for server event and status monitoring, including I/O errors, system temperature and hardware faults.	Shipping. $2,784 per server.
Thomas-Conrad (800) 332-8683	Sectra Token-Ring Server for NetWare V.1.00	Collects data and provides security for up to 8 rings. The streamlined console interface provides access to ring and node counters, event logs and other ring information. Using the optional Windows client, multiple server modules can be controlled and monitored concurrently.	Shipping $495 per server.
Network node management (such as servers, clients and printers)			
Touchstone Software Corp. (800) 531-0450 (714) 969-7746	CheckIt LAN 2.1	Lets you troubleshoot problems on a LAN without ever leaving your desk. Check the hardware and software at any workstation, perform a software inventory, scan every PC attached to the network for viruses and monitor network activity for problems and usage. Certification in progress. Also available as a VAP.	Shipping. 5, 20, 50, 100 and 250 users for prices ranging from $249 - $1995.
3Com Corp. (800) NET-3COM (408) 764-5000	Linkwatch V.1.0	Provides SNMP agent structure for managing desktop network links from any SNMP manager. Agents actually integrated with adapter drivers and occupy merely 2K of desktop memory. Covers other adapters besides 3Com's. (Includes an NLM called SoftHub/NLM, among other items.)	Shipping. $395 per install (covers an entire LAN).
Frye Computer Systems (800) 234-3793 (617) 451-5400	LAN Directory V.1.1	Allows computer managers to automatically track their PCs and Macintoshes including standalone workstations, file servers and hundreds of hardware and software elements. LAN Directory offers a high level of details, as well as a full-feature custom report writer for maximum flexibility. Certification in progress.	Shipping. 50 connections for $495; additional 100 connections for $395.
Network Computing, Inc. (214) 746-4949 (800) 736-3012	LANAlert V.2.0.2	A comprehensive IPX-based network management architecture consists of four modules: Network Management Server, Consoles, Agents and Gateways. LANAlert is a proactive system that increases up-time by alerting you to impending problems before your network goes down.	Shipping. $995 for LANAlert; $595 for F/S Agent.
	LANExam V.1.0.1	Monitors the hardware configuration and software installed on all the NetWare servers and workstations. It also monitors all NetWare network segments and IPX routers. All alert, inventory and configuration information is stored in an SQL queriable database. Also available for NetWare 2.12+ servers.	Shipping. $595 per 100 nodes.
	LANExam SNMP Manager	Distributed polling system for monitoring SNMP devices on the network.	Announced. Shipping in 1Q '93.
	LANPage V.1.0.4	LANPage is a server-based application that reports Network Computing's LANAlert alerts to a pager. Tells you when there is a problem with the LAN. You can also filter alerts by priority level.	Shipping. $295.
Intel Corp.	LANSight	(Certified 7/92.) Remote LAN node support. Allows user to assign aliases to network workstations using node addresses as the key and offers various diagnostic tools to analyze network connections. Comes as both an NLM and a VAP.	Shipping. $395 per server.
Cheyenne, Inc. (800) 243-9460 (516) 484-5110	Monitrix 2.2	Takes an automated approach to network management, providing a wide range of high-performance activities for network managers, including a complete system inventory, point-to-point connectivity tests and performance analysis. Pager and E-mail alert systems enhance its monitoring capabilities. Also available as a VAP.	Shipping. $895 per server (includes VAP and NLM).
Frye Computer Systems (800) 234-3793 (617) 451-5400	NetWare Console Commander V.1.0	Allows you to schedule any NetWare V.3.1+ console command to take place automatically at the time that you set. Select the server, the commands and the time and our software will do the rest. You can clear connections that interfere with your backups, send messages, load and unload NLMs, run NCF files, set NetWare's user-configurable parameters and run server-based programs. Certification in progress. .	Shipping. $395 per server.
	NetWare Early Warning System V.1.11	Monitors over 50 NetWare 286 and 386 critical statistics; notifies by pager, electronic mail, voice and more; fixes or responds to events automatically. It completely redefines network management by automating hundreds of tasks that should be performed but often slip through the cracks until a major failure occurs. Certification in progress	Shipping. $495 for first server; $395 for addtional servers.
	NetWare Management 1.1	Includes extensive graphic and reporting functions as well as providing for Disaster Recovery support, Enhanced Troubleshooting and Diagnostics. Provides real time information on file server utilization, server memory and resource statistics. LAN driver information, utilization per current connection and workstation information. Certification in progress.	Shipping. $495 for first server; $395 for addtional servers.
Novell, Inc. (800) NETWARE	NetWare Server Agent	Provides statistics on configuration, performance and status of NetWare server. Works in conjunction with DOS-based NetWare Management Map.	Shipping. 1, 20, 100 and 500 users for $495-$150,000.
	STAT.NLM	STAT.NLM records NetWare 3.11 server resource utilization statistics, saving them in a binary file. An associated file, DUMPSTAT.EXE runs on a client PC and reports statistics for analysis by a database, spreadsheet or other program.	Free of charge with 3/92 issue of AppNotes ($15) Research Order Dsk (800) 453-1267 x5380.
NLM Management			
Nu-Mega Technologies, Inc. (603) 889-2386	NET-Check V.1.12	(Certified 2/91 and 8/91.) NET-Check Monitors NLMs on the server and prevents the NLMs that NetWare loads into the most sensitive Ring 0 of an Intel microprocessor from writing over memory. Checks NLMs in background to detect memory violations that could crash the server.	Shipping. $499 per server.
Knozall Systems (602) 545-0006 (800) 333-8698	NLMAuto V.1.2	NLMAuto provides power to schedule loading, executing and unloading of NLMs, NCF files and Console Commands. NLMAuto minimizes the dedicated memory required by NLMs, maximizes RAM for caching and results in improved network performance.	Shipping. $395 per server.
Nu-Mega Technologies, Inc. (603) 889-2386	NLM-Profile V.1.12	Identifies NetWare 3.X "Server Hogs". NetWare V.3.X is not able to prevent NLMs from holding on to the CPU too long. NLM-Profile displays timing information for each NLM to let you know if any NLM fails to relinquish the CPU in a timely fashion.	Shipping. $199 per server.
Performance			
Novell, Inc. (800) NETWARE	Burst Mode NLM	Improves NetWare workstation and server performance by transferring large amounts of data in response to a single request.	Shipping. Site license for $30. Available in DOS/ Windows client update kit.
	Large Internet packet Exchange NLM	Allows large packet size transmissions between servers and workstations through IPX routers. (Anticipated availability on Novell's bulletin board, NetWare Express, this month.)	Shipping. 10 users for $1200 from Novell Consulting Services
	Service Advertising Filter NLM	Reduces Service Advertising Protocol broadcasts over an IPX internet. Also enhances network security through options such as limiting which servers can be seen across the internet.	Shipping. 10 users for.$1200. Also included with Multiprotocol Router as a site license.
Printing			
NorthNet Research (519) 669-1311	JETware (software portion of JETstream)	JETstream is a high-speed printer enhancement card. Increases printing performance on a Novell network. Can push out more than 150,000 characters per second, increasing throughput up to 50 times, while cutting demand on the CPU by 95%.	Shipping. $395 per printer (includes hardware).

Vendor	Product name	Description	Availability and pricing
Printing			
Intel Corp. (503) 629-7835 (800) 525-3019	LANSpool	(Certified 3/92.) Supports management of network printing operations. Print server supports up to 60 printers and 120 print queues in a NetWare V.3.X environment. LANPrint utility offers pop-up printer selection from within the user's application. Also available as a VAP.	Shipping. $495 per server.
Digital Products (800) 243-2333 (617) 924-1680	LANSprint	An add-In PC board product and software that, when installed in a file server or remote workstation, increases the printing speed for business printing graphics and font downloads by 6 to 50 times.	Shipping. $395 per printer.
Program development software			
Micro Focus (800) 872-6265	Micro Focus Fileshare NLM for NetWare V.1.0	File server for multiuser applications. It provides shared access to multiple files, file update logging, roll forward recovery and transaction processing. Shared files may be accessed through standard COBOL, I/O or through a special call interface.	Shipping. $250 per server.
Nu-Mega Technologies, Inc. (603) 889-2386	NLMCHECK V.1.12	Inspects NLMs under development for any code that might cause memory corruption on the server. Catches both uninitialized and wayward pointers .	Shipping. $499 per server.
	Soft-Ice/N V.1.12	Low-level debugger for software development under V.3.X. Provides real-time breakpoints on memory reads/writes, port reads/writes, memory ranges and interrupts; use of all available NetWare syM bytesolic variables including kemel variables, exports and debugger syM bytesol tables.	Shipping. $499 per server.
Routers			
Newport Systems (800) 368-6533 (714) 752-1511	LAN2LAN/ Mega Router for NetWare V.3..01a	Wide area network router includes support for multiple routing protocols (IPX/SPX, TCP/IP and AppleTalk), data compression, multiple ports, multiple Novell platforms (V.3.X, V.2.X, Multiprotocol Router, Runtime), multiple WAN protocols (HDLC and X.25) and 1.2 K bit/sec to T1/E1 speeds. Also available as a VAP.	Shipping. $2495 - includes adapter card and software.
Novell, Inc. (800) NETWARE	NetWare Multi-Protocol Router V.2.0	Supports the routing of IPX, IP, AppleTalk, Novell NetBIOS and OSI protocols over Ethernet, Token Ring, FDDI, LocalTalk and ARCNET. The product also includes NetWare Hub Services.	Shipping. $995 per server.
	NetWare WAN Links V.2.0	Connects geographically dispersed networks. Supports IPX, IP, AppleTalk and OSI over leased lines using the Point-to-Point Protocol and X.25.	Shipping. $1,495 per server, not including required adapters.
	NetWare SNA Links V.1.0	Works with NetWare for SAA to route IPX/SPX protocols over SNA network connections.	Shipping. 1, 20 and 60 users for $1,250, $18,000, $40,000.
Firefox Communications (206) 827-9066	NOVIX for NetWare	Enables NetWare client PC workstations to access Unix and other hosts supporting TCP/IP. Supports applications such as Telnet and the File Transfer Protocol plus industry standard API's through communications services in a NetWare server. Also available as a VAP.	Shipping. 5,10,20,40,60,80, 100 sessions for $700 to $6200.
	NOVOS for NetWare	NetWare-to-OSI host communications system incorporating ISO Open Systems communications protocols. Supports workstation programs for communication to ICL VME mainframe systems over OSI Transport protocols and communication to Unix host systems over OSI Transport protocols. Also available as a VAP.	Shipping. Pricing unavailable.
Polygon, Inc. (314) 432-4142	Poly-PORTAL V.1.01	Software for non-Ethemet NetWare to VAX/VMS connectivity which provides communications to a VAX/VMS host over any topology supported by Novell's IPX protocol, such as Token Ring and ARCNET. PORTAL is supported with any terminal emulator that supports the 6A DEC LAT interface.	Shipping. 5, 10 and 15 users for $795, $1490, $2235.
EICON Technology (514) 631-2592	Router for NetWare V.3.1	Designed to interconnect NetWare LANs for transparent sharing of resources by all workstation users. It supports IPX/SPX, TCP/IP and AppleTalk LAN protocols over X.25, frame relay and leased lines. Includes data compression, Router Manager's Console and auto reconnect.	Shipping. $995 per server.
Security and virus protection			
Central Point Software, Inc. (503) 690-8090	Central Point Anti-Virus for NetWare	Recognizes more than 1,300 known viruses including both file and boot sector viruses. Provides advanced virus protection, network-wide virus scanning, centralized program administration and complete reporting. Supports DOS, Windows and Macintosh clients.	Shipping.Price unavailable.
Cheyenne, Inc. (800) 243-9642 (516) 484-5110	InocuLAN V.1.1	(Certified 9/92.) A comprehensive, server-based anti-virus program designed to protect a Novell network, file servers, networked PCs and stand-alone PCs from viruses. Also available as a VAP.	Shipping. 20 and 250 users for $495 and $995.
Netwave, Inc. (212) 242-3200	LANtrail V.3.1	Audits users' network file activity. Activity reports can focus on the actions of a single user or group of users on any file or set of files on the network. Reports can be imported into popular spreadsheets and databases. Also available as a VAP.	Shipping. $695 per server.
Intel Corp. (503) 629-7354 (800) 525-3019	LANProtect	(Certified 2/92 and 9/92.) A server-based utility that safeguards Novell NetWare V.3.1X environments against computer viruses. Detects and isolates 900 viruses. Safeguards against sneak attacks from workstations, network services, modems, fax cards or other network services.	Shipping. $995 per server.
Blue Lance (713) 680-1187	LT Auditor 4.0	Runs as an NLM on the server and TSR (taking up 10K bytes) on the client PC. Audits and inventories hardware and other client configuration information when files are created, read, written to, reopened or deleted.	Shipping. $695 per server.
Cordant, Inc. (800) 843-1132 (703) 758-7000 (formerly Centel Federal Systems)	Net/Assure Server	An information security product based on hardware and software installed on NetWare servers. Net/Assure Server's security benefits can be gained for both secured and non-secured workstations through the use of its standard menu system on their server console. Certification in progress.	Shipping. $499 per server. $399 for 50 or more servers.
Rainbow Technologies (714) 454-2100 (800) 852-8569	NetSentinel	(Certified 12/91.) Server-based access control software license protection. Part of keyed physical hardware security product for network services. Comprised of 3 components: Security Server program, the hardware key and an API to ensure that network license limits are controlled.	Shipping. 1 to unlimited users for $49 to $299.
Netpro Computing (800) 998-5090 (602) 998-5008	NetShield NLM by McAfee V.1.03	Blocks viruses from being transmitted over a network by scanning files as they are accessed from the server. It also performs regularly scheduled scanning of the server on either a daily, weekly, or monthly basis and automatically handles infected files.	Shipping. $265 to $495 per server depending on volume.
System Fault Tolerance			
Vortex Systems (412) 322-7820	TC376 Storage Management System	(Certified 12/91.) Hardware and software product that performs continuous backup, automatically and transparently, including open files. Protects against primary disk crashes by allowing the server to continue running as if nothing had happened.	Shipping. $3,495 per server.
Uninterruptible power supplies (UPS)			
Best Power Technology, Inc. (608) 565-7200 (800) 356-5794	CheckUPS II for Novell NLM	Gathers information from a UPS and displays it graphically for network management. Safely shuts down server in the event of a power failure and broadcasts message to LAN users notifying them of the outage.	Shipping. $299 per UPS device.
Network Security Systems, Inc.(NSSI) (619) 587-7950 (800) 755-7078	Lansafe II and FailSafe	(Certified 8/91.) Remote and local console allows network managers to view and modify power parameters for any NSSI IPS/A.I. on the LAN. Managers can monitor actual load in volt-amps and watts, check utility voltage, frequency and battery charge of any workstation or server locally or remotely. Also available as a VAP.	Shipping. $99 to $249.
Meirick, Inc. (800) 735-5068 (800) 735-2322 (303) 668-3251	Meirick Network NLM and Meirick/ PowerMon/NLM	The Meirick 600 SL comes with its own NLM for managing unattended shutdown and user notification. Meirick Network NLM provides automatic shutdown software for 386 Novell file servers. Meirick/PowerMon NLM is automatic VAP/NLM shutdown software for Novell file servers. Also available as a VAP.	Shipping. $89 per site for Network NLM, $99 for PowerMon.
Minuteman UPS (214) 446-7363 (800) 238-7272	Minuteman's Network Manager	Minuteman manufactures a complete line of UPSs including standby, line interactive, on-line and voltage regulators from 300 VA to 10K VA with pricing starting at $159. The line includes software for unattended shutdown for all major LAN operating systems.	Shipping. $99 per server.
Trippe Manufacturing Company, Inc.; Tripp Lite Div. (312) 329-1777	Omni 750	The Omni 750 comes with its own NLM for managing unattended shutdown and user notification.	Shipping.Price unavailable.
American Power Conversion Corp. (410) 789-5735 (800) 800-4272	PWRCHUTE.NLM for the Smart UPS 600.	(Certified 4/92.) Monitors Input voltage to the file server. The NLM collects incoming data, such as input and output voltage, battery load and temperature.	Shipping. $599 for the UPS 600; $99 for the NLM.
Workgroup Applications			
Isicad, Inc. (714) 533-8910 (800) 634-1223	Cadvance V.4.0	(Certified 3/91.) Full featured graphics intensive CAD program with database links. Used for facilities management. Only CAD-based product to be certified by Novell. NLM support is only available in the DOS-based product., not the newer Windows version.	Shipping. $1,995 per user.
Lotus (800) 345-1043 (617)577-8500	Lotus Notes	Provides support in Notes for Novell's Message Handling Services and NetWare Global messaging as alternative Notes messaging engines. The product is being developed to NetWare V.4.0.	Mid-1993. Price not available.
Sinper Corp. (800) 822-1596 (908) 755-9880	Spreadsheet Connector V.2.0	Allows sharing of Lotus 1-2-3, Excel and TM/1 spreadsheet data on a LAN. Allows users to create and control their own spreadsheets while working with one consistent pool of information. Changes to the shared data are reflected at the client workstations in real time. Certification in progress.	Shipping. 5 to 50 users from $4,995 to $34,995.
WordPerfect Corp. (801) 225-5000 (800) 451-5151	WordPerfect Office	WordPerfect is developing with Novell an NLM for WordPerfect Office to support electronic mail, calendaring and group scheduling.	Pricing and availability unannounced.

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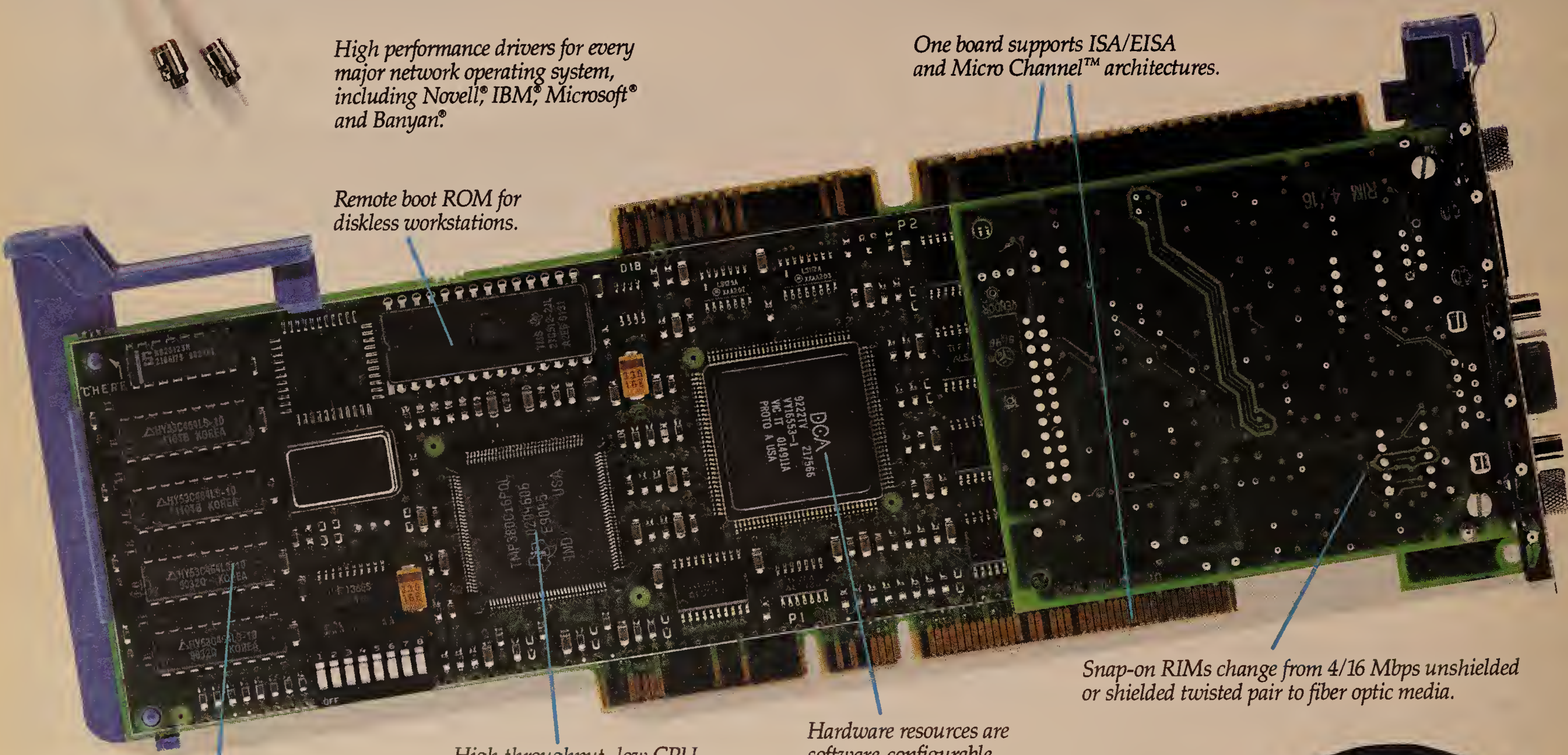

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SEE US AT NETWORLD BOOTH #1136

Circle Reader Service #21

Architecture not the sole ATM question

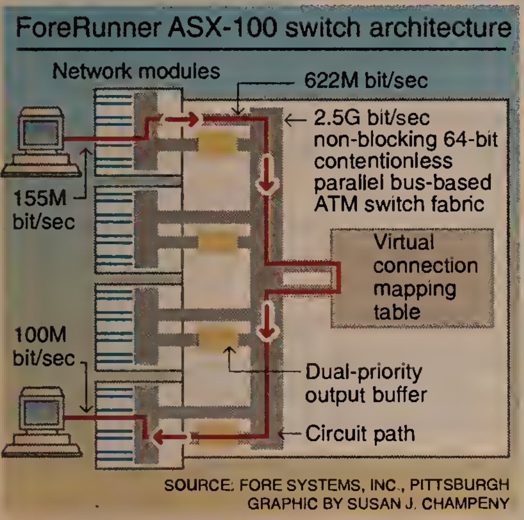
continued from page L2

high-speed parallel buses (2.5G bit/sec and higher) via a cost-effective, single-stage space division switch.

To build very large, geographically diverse ATM networks, multiple switches can be connected in a seamless ATM switch network architecture.

Since ATM switches are intelligent and have full knowledge of the ATM network topology, individual ATM cells can be routed across complex mesh network topologies.

ForeRunner ASX-100 switch architecture


Network modules
622M bit/sec
2.5G bit/sec non-blocking 64-bit contentionless parallel bus-based ATM switch fabric
155M bit/sec
Virtual connection mapping table
100M bit/sec
Dual-priority output buffer
Circuit path

SOURCE: FORE SYSTEMS, INC., PITTSBURGH
GRAPHIC BY SUSAN J. CHAMPENY

Finally, while the comparison of parallel bus-based vs. multistage switch-based architectures is intellectually interesting, both architectures have their relative merits depending upon the application.

When the dust settles, however, the real issues will be whether the switch is available, whether it is price competitive, whether it meets its published specifications and whether it meets the needs of distributed multimedia and data networking applications.

> It is important to keep in mind that switches are only one part of a complete ATM networking solution.
>
> ▲▲▲

End-to-end ATM networking

It is important to keep in mind, however, that switches are only one part of a complete ATM networking solution.

For complete end-to-end ATM networking, vendors must also provide a range of ATM adapters for workstations and personal computers, interfaces to wide-area network services and systems software to link the network components.

ATM adapters are needed for a wide range of popular workstations, including those from Sun Microsystems, Inc., Hewlett-Packard Co., Digital Equipment Corp., IBM, NeXT, Inc. and Scientific Glass and Instruments, Inc., and MCA- and EISA-based PCs. These adapters can be built using custom-designed or off-the-shelf ATM components.

Network performance is not so much dictated by adapter technology as by the overall hardware and software architecture of the workstation. Today, network performance is limited in most workstations by the operating system overhead. In order to take full advantage of ATM performance, improvements are being made to systems software.

Another critical piece of the puzzle will be the ATM adapter's ability to support industry-standard Internet Protocols. The Internet Engineering Task Force (IETF) put forth a proposal for IP-over-ATM that should be adopted shortly by the ATM Forum.

On the wide-area network side, interfaces will be required for private and public networks.

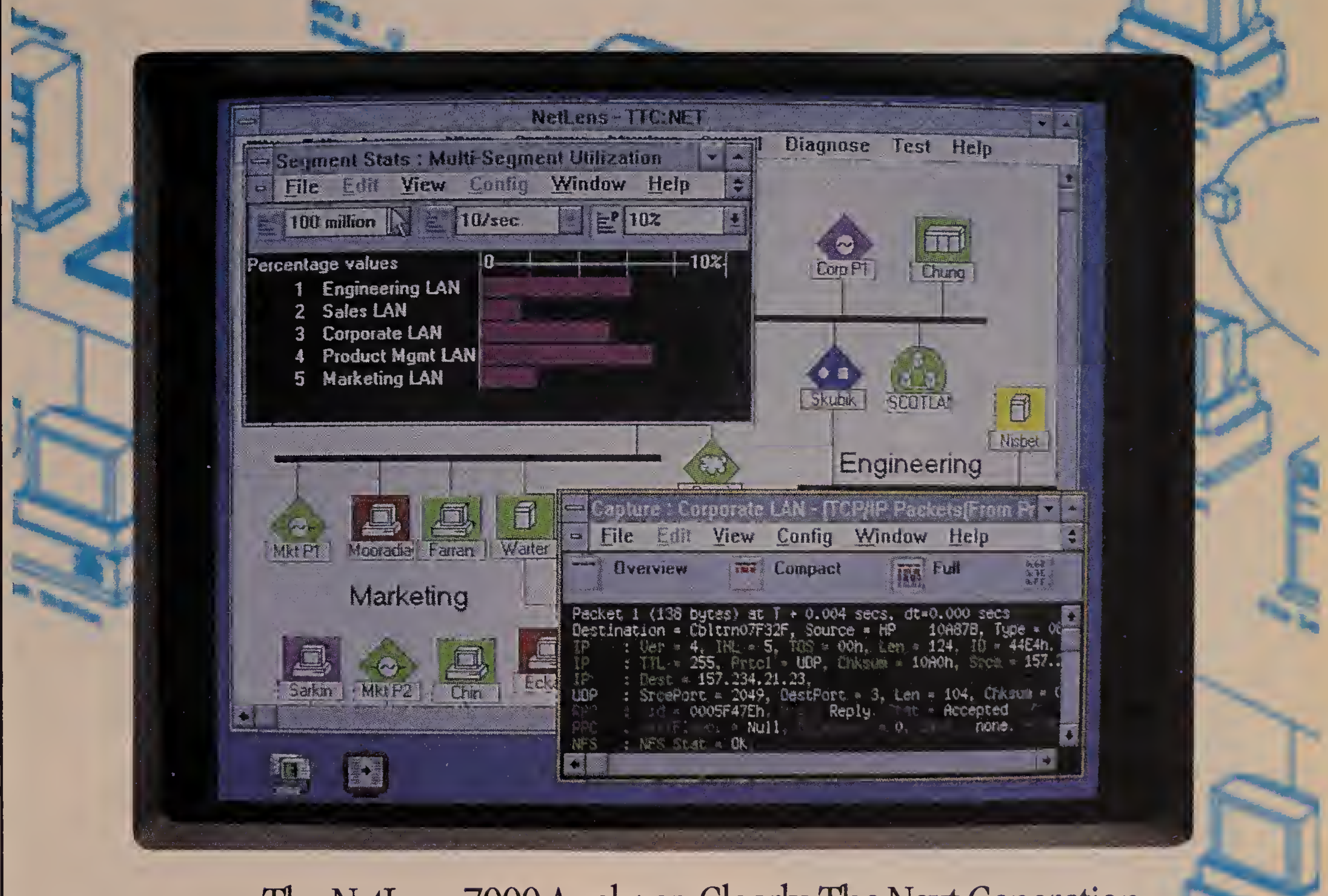
Initially, customers will use 45M bit/sec T-3 and SONET links to build private ATM networks. The T-3 and SONET interfaces can be integrated into a backbone switch or can be provided by a separate data service unit/channel service unit or multiplexer. Advantages to integrated interfaces include a single-device solution, lower network costs, decreased network delay and simplified network management.

Public network ATM services will obviously be longer in coming. While they will use the same physical interfaces as private ATM WANs, the control software required to manage the interface will be more complicated.

Working with existing nets

Since ATM networks will not replace the existing network infrastructure in the near future, interoperability with existing networks is a key requirement for successful deployment of ATM networks.

(continued on page L14)



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Percentage values
1 Engineering LAN
2 Sales LAN
3 Corporate LAN
4 Product Mgmt LAN
5 Marketing LAN

```
Packet 1 (138 bytes) at T + 0.004 secs, dt=0.000 secs
Destination = Cbltrn07F32F, Source = HP    10A87B, Type = 0
IP    : Ver = 4, IHL = 5, TOS = 00h, Len = 124, ID = 44E4h,
IP    : TTL = 255, Prtcl = UDP, Chksum = 10A0h, Srce = 157.
IP    : Dest = 157.234.21.23,
UDP   : SrcePort = 2049, DestPort = 3, Len = 104, Chksum = 
RPC   :  id = 0005F47Eh,          Reply,  Stat = Accepted
RPC   :          = Null,                = 0,         none.
NFS   : NFS Stat = OK
```

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As the complexity and importance of your internetwork grows, traditional LAN analyzers just aren't enough to help you optimize performance and troubleshoot problem areas across your enterprise network. The NetLens 7000 from TTC is the next generation in distributed LAN analysis systems, designed specifically to provide network managers with the necessary information to help increase the availability of internetworks.

NETLENS

The SNMP RMON MIB is quickly emerging as the standard for remote analysis of enterprise networks. With the industry's most extensive implementation of RMON, the NetLens 7000 provides you with the foundation to integrate network analysis into your multi-vendor network management system.

What's more, NetLens 7000 doesn't limit you to analyzing a single LAN segment at a time. With NetLens, you can simultaneously look at data from hundreds of sources and all the segments within your internetwork. And with NetLens' superior graphical user interface and mapping, all this can be presented in a flexible, user-defined view.

NetLens also gives you the most comprehensive statistical monitoring possible for ongoing performance management. And although stats are important, you need more than that. You need extensive decode capabilities to help isolate protocol anomalies caused by things such as router or server misconfiguration, as well as software incompatibilities. NetLens provides that, with packet capture and decodes of protocols such as TCP/IP, SNA, NetWare, OSI, XNS, VINES, DECnet, AppleTalk, 3COM, plus many, many more. All of these are presented in plain English, so you don't need an analyzer to figure out your analyzer results.

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Circle Reader Service #37

Architecture not sole ATM question

continued from page L13

Interoperability can be achieved via conventional internetworking devices, such as routers and hubs, or via the ATM equipment itself.

In general, connectivity to existing LANs will be achieved via routers or an ATM switch with integral routing.

As in any new network technology, interoperability on paper is vastly different than interoperability in the field. Thus, even though vendors faithfully follow the implementation specifications from the ATM Forum and the ATM standards from ANSI and CCITT, the only true test of interoperability will be linking equipment from different vendors.

Some vendors have already begun this process by demonstrating equipment interoperability at trade shows. Several vendors have proposed that the ATM Forum or another suitable organization establishes an interoperability lab, which will test and certify interoperability between ATM equipment.

The other side of the interoperability coin is test equipment vendors' ability to access and diagnose equipment from multiple ATM vendors. The ATM Forum recently began defining and specifying means for ATM test equipment to access traffic in an ATM switch ("ATM Forum vendors team to test spec for ATM nets," *NW,* Nov. 30).

With this testing specification, test equipment will diagnose problems such as incompatibilities between equipment, error conditions and standards conformance. Essential components of this testing specification include physical test-port access, ability to tap into virtual connections and a standard Simple Network Management Protocol Management Information Base (MIB).

Network management

Last, but never least, is network management. ATM networks must be manageable from standard SNMP management platforms such as SunConnect's SunNet Manager, HP Openview or from Cabletron Systems, Inc.'s Spactrum management system.

The basis for ATM network management is provided by the local management SNMP MIB specified by the ATM Forum. Vendors build on this MIB in order to provide the ability to control links and connections in ATM networks. These vendor MIBs should include a wide variety of information about switch and end-station performance, connection establishment and status, as well as inventory management.

Equally important, network management information must be accessible from a variety of management stations throughout the network.

> Reliance on a single, dedicated vendor-specific management platform is not acceptable in today's distributed management environment.
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Reliance on a single, dedicated vendor-specific management platform is not acceptable in today's distributed management environment.

Unlike existing networks, ATM network management will not be added as an afterthought. Because ATM networks are based on intelligent switches, network management capabilities are inherent.

Moreover, the performance and scalability of ATM networks ensures that 'Moves, Adds and Changes' can be carried out with minimal intervention by network administrators.

In summary, ATM networks deliver the performance needed by users for distributed applications including data visualization, medical imaging, computer-aided design and management, multimedia communication, videoconference and high-speed data networking.

This potential will be realized in a significant way only if vendors address the real-world issues of cost-effective ATM switching, end-to-end ATM networking, interoperability with existing networks, interoperability between ATM vendors and network management.

During 1992, significant and rapid progress was made on these issues. The work of the ATM Forum Technical Committee, in particular, allows users to begin installing work group and backbone ATM networks. The year ahead will bring further proof that ATM is the right networking technology at the right time. ▣

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Circle Reader Service #35

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Provides performance statistics.

Monitrix provides network performance statistics that identify potential problems and aid in network analysis and capacity planning.

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Circle Reader Service #20

LAN links represent next challenge

continued from page L2

passing through your company's network to get into one of its trading partners' networks.

This could be costly as well as dangerous. Using standard LAN commands, an intruder can gain access to all network elements, including bridges, routers management workstations and LAN interfaces. Potentially, an intruder could pass through to other networks, as well.

The most desirable approach to network security is to require a logon at network entry. But there are several difficulties in implementing this authorization scheme. The logon screen and authorization must be done at an application layer. When multiple protocols are used, there is the problem of knowing which application protocol to use to send the logon screen. This must be determined before the first message is received from the customer.

The other problem is that once a logon is completed, there needs to be a mechanism built to ensure that every successive message comes from only that user while messages originating from unauthorized users on the same remote network are blocked.

But not all messages are initiated by a person, meaning simple logons cannot always be used to solve the network security problem. Many applications and NOSes communicate indirectly through intermediate gateways and servers. NetWare servers, for example, provide internetwork communications services, and many database packages will assemble pieces of data from several databases on behalf of an end user. These challenges need to be addressed before a logon security solution can be implemented.

Today's solution to providing security at the network level is to use filters on the entry bridge or router. Almost all bridges and multiprotocol routers have them. Filters can block messages from unauthorized LAN interfaces, addresses or workstation names.

Some offer more sophisticated filtering by limiting the number of bridge hops, LAN segment numbers, service access points (protocol type), network numbers (or names) and user names.

Proteon, Inc. routers will filter on any field in an incoming message. The most secure approach is to have filters that only accept universal addresses (hard-coded in the network interface board hardware) and to match authorized sources with destinations. You should also consider limiting service access points and bridge hops.

There are, however, two key limitations with filters. One is that they may be difficult to administer. Keeping track of all the sources, destinations, protocols and LAN numbers, among other things, can become cumbersome with numerous adds, changes and deletes. Most bridge and router products require code reloads to input these changes. This results in scheduled outages.

The other limitation is more of a concern to the audit department. Authorizing a LAN interface is not the same as authorizing a person. Filter security is only as good as your trading partners' workstation security. Auditors prefer to hold people accountable and not machines.

Network isolation is the final challenge to be negotiated before extending client/server links to partners and a factor that is important in protecting both companies.

Isolation limits the information that can be exchanged among networks, preventing outages from excessive overhead, potentially harmful messages, network problems and unintentional pass-through traffic, all of which can crop up if the doors are left wide open.

The first consideration must be to contain overhead. Broadcast messages such as route discoveries, multicasts, management flows, status, keep-a-lives, routing table updates, route tests and datagrams can pour out of one network into another, sometimes overwhelming smaller networks.

Duplicate names or addresses can also cause major headaches if not isolated. Two servers, SNA front-end processors or subnets with the same name or address can cause chaos. These types of problems are particularly difficult to discover. Everything appears normal since the resources remain active and, therefore, appear accessible.

Most TCP/IP network isolation problems are resolved by routers. Routers running exterior gateway protocols contain most types of network overhead within each native network. The IP addressing structure along with registration with the Internet guarantee network uniqueness.

However, other network protocols are not as easily handled. NOSes that are implemented over source route bridging token rings can be particularly difficult. Fortunately, Cisco Systems, Inc., IBM and

(continued on page L17)

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LAN links represent next challenge

continued from page L16

CrossComm Corp. have routers that block broadcasts by learning network locations. Filters are the only solution to block duplicate network names and addresses.

Like early pioneers, companies that want to link their internets are going it alone for now, but help is on the way.

The Ernst & Young survey showed strong interest in a variety of public-supplied LAN interconnection services. And in response to demand, a number of value-added network carriers have recently announced corporate LAN interconnection services.

These vendors include Sprint Corp., CompuServe, Inc. and IBM/Information Network. These services will typically be providing transport, equipment, support, management, security consulting and operational maintenance. Sprint's prices for its TCP/IP service begin at $1,050 per month for a 9.6K bit/sec connection and extend to $3,300 a month for T-1 service. Installation costs vary between $660 and $1,000.

> Like early pioneers, companies that want to link their internets are going it alone for now, but help is on the way.
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Given the demand, these services can be expected to expand to cover more locations and more options. Wider protocol support security and administration are the main areas where expansion is needed, but it is too soon to expect them in the near future.

At the network layers, routers that implement standard or de facto routing protocols have mostly solved the compatibility problem. At the higher layers, the market is still immature in connecting unlike Network Operating Systems; however, there are few problems when the NOS is the same on both sides.

Security, the problem most regard with concern can be solved to a large degree using filters. However this solution will quickly become unmanageable as the number of connects grow. Network isolation is the greatest challenge. Routers have addressed some of the problems, but still have a ways to go. ◻

Simon is telecommunications engineer project manager at The Travelers Corp. in Hartford, Conn.

DEC looks to tighten LAN integration

continued from page L2

disparate components of a single network.

The integrated file service capabilities will allow users to access files from any of the three environments, regardless of the file system they are using, according to Holman.

File integrity will be maintained through record locking, she added.

"Customers are finding they have a number of these different technologies," Holman said. "What they really want is to be able to have shared access to files regardless of whether [they are] using NetWare file services or LAN Manager-based services or a Macintosh."

Users say Holman's observation is on the mark. "When people start talking about [Pathworks] performance issues, one of the things that comes up is the translation between file systems," said Gary Mauler, a fellow engineer at Westinghouse Electric Corp. in Baltimore. "Hopefully, [DEC] would make some improvements there." ◻

Miramar debuts PC-based file server

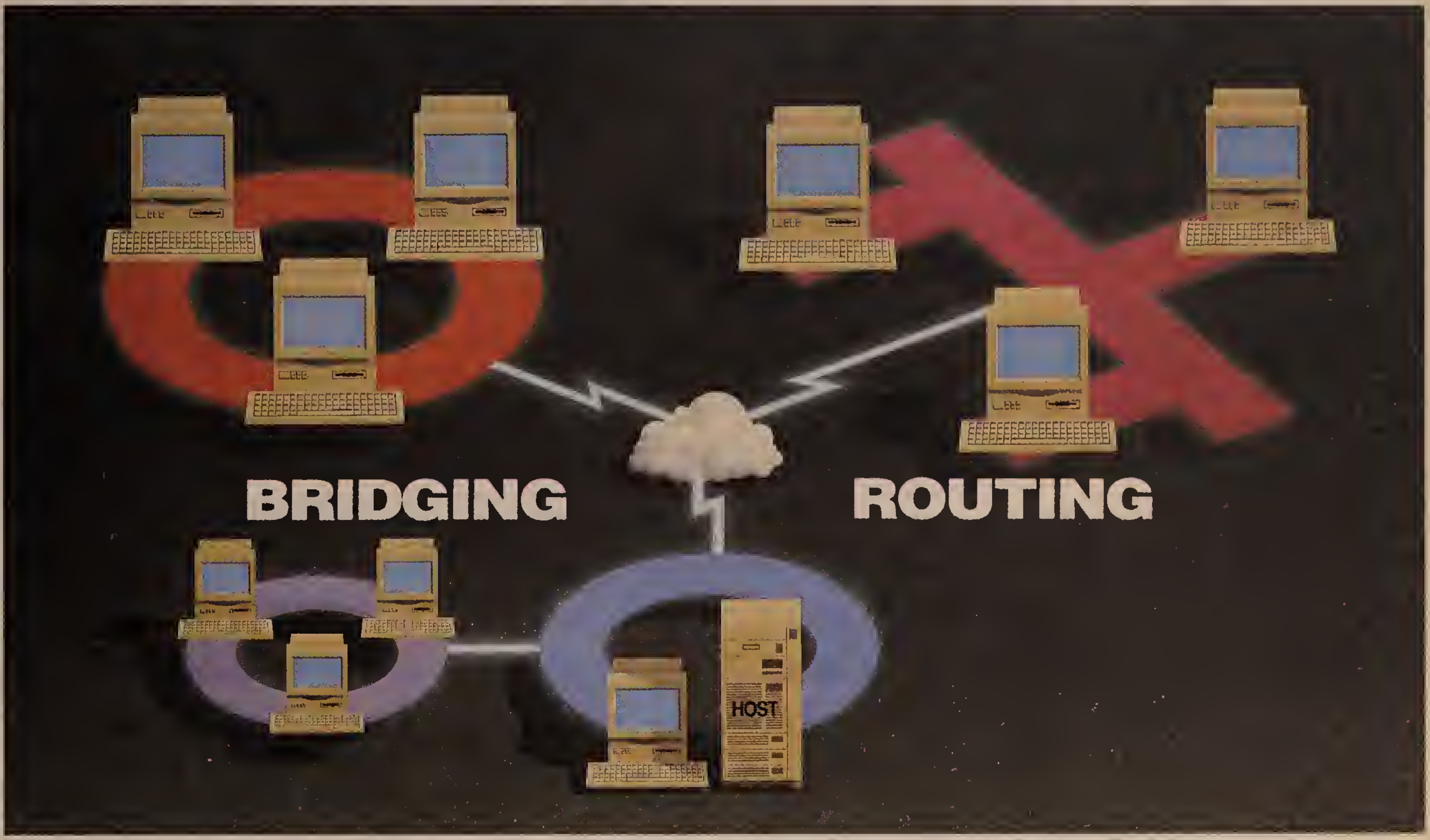
continued from page L2

It also enables users on a PC network to access Macintosh files stored on any network server. Macintosh files appear with traditional DOS file names to the PC user, and file attributes and record locking are supported in both the PC and Macintosh environments.

The product can be used with Apple's LocalTalk, EtherTalk or token-ring cabling systems.

In addition, MacLAN Connect Gold comes with the MacLAN Administration program, which is software that enables it to be managed from any Macintosh workstation on the network.

Available now, MacLAN Connect Gold supports an unlimited number of network nodes. The product is priced at $695 per server. ◻



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Circle Reader Service #34

Network World With Simmons.

According to the recent Simmons CompPro Study, it's high marks for *Network World* with the people who buy for the network.

One look at the study's findings, and it is clear. Among networking and LAN publications, *Network World* is in a class all by itself. In fact, those who purchase for their entire organization are more likely to turn to *Network World* for the network information they need than any other networking or LAN publication in the industry. What's more, those with both a LAN and WAN installed at their company are also more likely to read *Network World*.

And it's not that easy to make the grade with Simmons. Simmons Research is one of the most highly respected media research companies in the country. Premiering December '92, their CompPro Study has already earned a standing as one of the most important research studies ever conducted in the information systems marketplace. In addition, the study highlights how useful readers find the publications that serve the IS market.

According to Simmons, it's this simple. If they buy for the network – including the multiplatform applications that run on the network – they're reading *Network World*.

And when we say read, we mean it. In fact, those who use network publication advertising and those who use publication editorial to make purchase decisions are again more likely to read *Network World* than any other networking or LAN publication.

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▶ **This list includes only highlights of the CompPro results. Find out the details of *Network World's* success by calling your *Network World* sales representative or Thomas J. Wilson at 800-622-1108.**

Source: Simmons CompPro, 1992.

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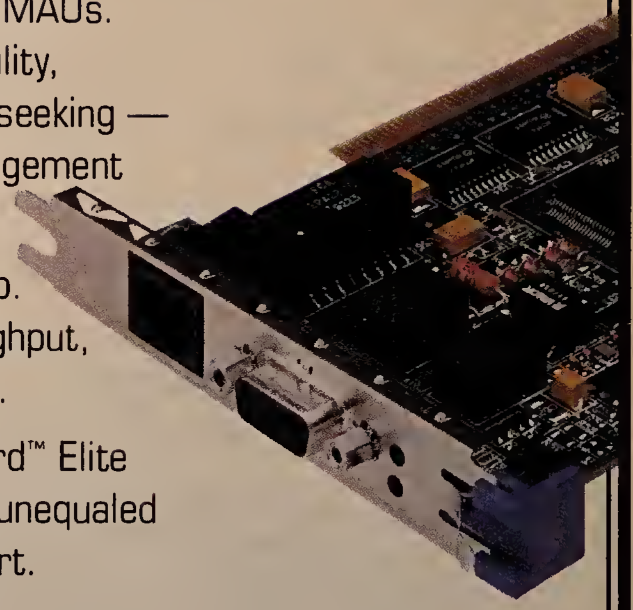

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Worth Noting

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Link Notes

SynOptics Communications, Inc. this week will announce LattisSupport, a new service and support program for end users that includes distribution of technical information and software updates.

The service includes telephone and on-site support, facsimile-on-demand services of network information, quarterly CDROM updates of new products, revised documentation on existing offerings and a bulletin board service.

LattisSupport is available now. For pricing, contact SynOptics at (800) 776-6895.

Webster Computer Corp. last week unveiled MultiPort Manager software that enables users to monitor and manage any number of the vendor's MultiPort Gateway routers from any Macintosh Plus workstation in the net.

Using the new software, net managers can set passwords for different MultiPort routers, which are designed to offload Ethernet traffic by routing traffic internally among four LocalTalk connections.

Available next month, the new software will ship free of charge with any MultiPort Gateway. Current router users can upgrade for $95. ◘

Ethernet-to-Ethernet router to make debut at NetWorld

Cayman's GatorBox EX targeted at Mac users.

By Maureen Molloy
Senior Writer

BOSTON — Apple Computer, Inc. networking vendor Cayman Systems, Inc. will announce at NetWorld 93 Boston this week its first Ethernet-to-Ethernet router.

The GatorBox EX is a two-port Ethernet router aimed at users with a large installed base of Macintoshes that have upgraded their AppleTalk nets from LocalTalk to Ethernet. The new router is similar to the company's existing GatorBox CS LocalTalk-to-Ethernet router but uses a 40-MHz Motorola, Inc. MC68030 microprocessor. GatorBox CS is based on the 10-MHz MC68000.

In addition to AppleTalk, the GatorBox EX will support the Transmission Control Protocol/Internet Protocol and DECnet Phase IV. It will also support encapsulation of AppleTalk data within TCP/IP packets, enabling users to link to corporate backbone work groups that do not route AppleTalk, as well as support wide-area network links.

The router can be configured and managed from any Macintosh on the net via Cayman's Macintosh-based configuration and management software, dubbed GatorKeeper. It can be monitored from any Simple Network Management Protocol-based network management system as well as from any TCP/IP host via Telnet.

GatorBox EX can be equipped with optional GatorShare EX gateway software, allowing Macintoshes to access Network File Service servers via an AppleShare interface. Unix-based users can print to AppleTalk printers using the Unix lpr print command.

The GatorBox EX, including an AppleTalk zone-hiding feature for security, costs $3,495 and will be available next month. ◘

Andrew to take wraps off new ware

By Maureen Molloy
Senior Writer

TORRANCE, Calif. — Andrew Corp. will announce at NetWorld 93 Boston this week two central-site routers as well as two PC-based bridges for remote sites.

Andrew's new PathWise/6505 multiprotocol bridge/router can house up to five three-port cards for a total of five local- and 10 wide-area connections, while the PathWise/6511 can support up to 11 three-port cards for a total of 11 local- and 22 wide-area links. Each card can support one local and two remote connections.

Both models support token ring and Ethernet on the local side and, on the wide area, X.25 and frame relay up to T-1 speeds. In addition, both route the Transmission Control Protocol/Internet Protocol, Novell, Inc.'s Internetwork Packet Exchange, Xerox Corp.'s Xerox Network Systems, Digital Equipment Corp.'s DECnet and Apple Computer, Inc.'s AppleTalk.

The devices support hot-swappable cards and an optional redundant power supply for fault tolerance. Future enhancements will include Reduced Instruction Set Computing-based Fiber Distributed Data Interface cards.

The routers cost between $12,400 and $51,600, and will be available by the end of the month.

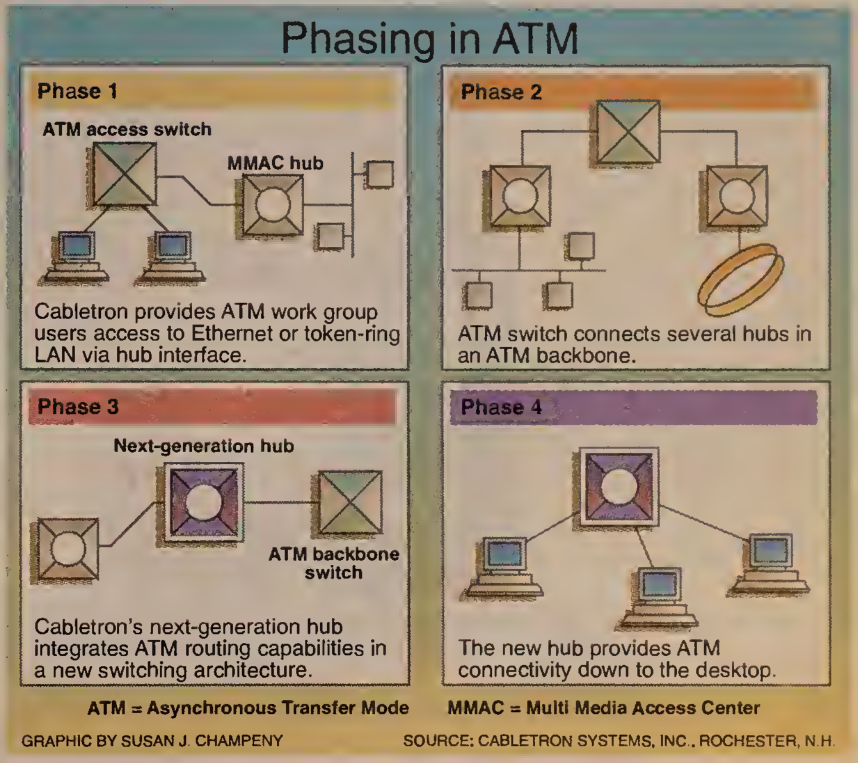
Along with the routers, Andrew will unveil Bridgeport/7212, a point-to-point access bridge that links token-ring nets at up to 1.5M bit/sec, and Bridgeport/7212-FR, a point-to-point bridge that can support either a T-1 link or a frame relay link at T-1 speeds.

Both are equipped with Flash erasable programmable read-only memory software that, in conjunction with Andrew's Bridge Manager network management system, enables users to download software upgrades from a central site. The bridges are compatible with IBM's LAN Network Manager and NetView.

The Bridgeport offerings are targeted at users in remote sites and can be installed in a personal computer-based file server.

Both bridges are available now. They are priced from $3,995 to $4,495. ◘

Phasing in ATM



Cabletron provides ATM work group users access to Ethernet or token-ring LAN via hub interface.

ATM switch connects several hubs in an ATM backbone.

Cabletron's next-generation hub integrates ATM routing capabilities in a new switching architecture.

The new hub provides ATM connectivity down to the desktop.

ATM = Asynchronous Transfer Mode
MMAC = Multi Media Access Center

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: CABLETRON SYSTEMS, INC., ROCHESTER, N.H.

Cabletron poised to begin ATM rollout

Hub maker to capitalize on deal with Fore Systems to deliver complete ATM solution in two years.

By Skip MacAskill
Staff Writer

BOSTON — Cabletron Systems, Inc. will use this week's NetWorld 93 Boston conference to demonstrate connectivity between its intelligent hub and an Asynchronous Transfer Mode (ATM) network, a capability promised in the first part of its four-phase ATM strategy.

The remaining phases of the ATM product development plan are expected to be implemented by the company over the next two years and include hub interfaces to an ATM backbone switch, a next-generation switching hub that integrates ATM functionality with support for traditional local-area networks and the ability to provide ATM connectivity to the desktop.

At the show, Ethernet users connected to Cabletron's Multi Media Access Center (MMAC) hub will be able to exchange Transmission Control Protocol/Internet Protocol-based files and electronic mail with ATM users attached to a Fore Systems, Inc. ForeRunner ASX-100 ATM switch.

Cabletron's new Distributed Network Server Media Interface Module (DNSMIM) in the MMAC will connect to the ForeRunner switch via a 100M bit/sec fiber link, allowing for the intercommunication. The DNSMIM will be available this quarter for $9,995.

The demo comes on the heels of the Cabletron-Fore Systems partnership that was announced last October when Cabletron first provided a rough outline of its ATM direction ("Wellfleet, Cabletron reveal ATM strategies," *NW,* Oct. 26, 1992).

The second phase of the Cabletron rollout involves the integration of an ATM/LAN routing module into the MMAC that will provide 100M bit/sec connectivity to an ATM backbone as well as net management capabilities for ATM networks.

The new hub module will serve as a router between multiple segments in the MMAC and ATM networks, providing segmentation and reassembly of LAN packets into ATM cells. The module will support the Simple Network Management Protocol and be managed via Cabletron's Spectrum net management system.

Multiprotocol support

"Unlike the NetWorld demo that will involve only TCP/IP protocol conversion, the routing module will support several protocols, including IPX, DECnet, OSI, AppleTalk and XNS," said Mike Skubisz, senior product manager at Cabletron.

The new module will be available in the third quarter. Pricing

(continued on page 111)

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*Server 295 does not presently support NetWare. **The three-year on-site warranty applies only to all newly announced IBM PS/2 machine types. Available Monday-Friday, 8 a.m. to 5 p.m. in your time zone. ††In Canada, call 1 800 465-7999. IBM, PS/2, Micro Channel and OS/2 are registered trademarks and HelpWare and HelpCenter are trademarks of International Business Machines Corporation. Windows is a trademark of Microsoft Corporation. Novell and NetWare are registered trademarks of Novell Corp. ©1992 IBM Corp.

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Performance Features	64 Bit 200MB IP Bus/Dual Micro Channels	40MB Data Streaming[†]/Dual Path Memory[†]	40MB Data Streaming
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A special supplement to

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The Newsweekly of Enterprise Network Strategies

Inside:

Larry Ellison & Phillipe Kahn on the future of software.

A view from the bridge of the Open Software Foundation.

Mitch Kapor explores the unfolding network frontier.

Drew Major discusses the new world order in LANs.

VISIONS of the ENTERPRISE NETWORK

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Circle Reader Service #14

EDITOR'S NOTE

The interaction of two basic elements fuels the network industry: people and technology.

In this special supplement, we've combined those two powerful elements to give you some insight into the present and future of networking.

We've profiled the people — users, vendors, technologists and theoreticians — who are shaping the development and application of the technologies that will reshape your networks in the years to come. Distributed databases. Object technology. Multimedia. Advanced data services and more.

We offer you their Visions of the Enterprise Network — their thoughts and perspectives on the forces driving the establishment of enterprise networks today and what those networks will look like in the years to come.

The most difficult aspect of producing this supplement was selecting the people to be profiled. The 16 people you'll read about here were chosen from an initial list of nearly 150 candidates nominated by our readers, as well as our User Advisory Panel, staff members and others.

After a good deal of debate, we chose to focus on people who've championed key technologies, those who have devoted their lives to seeing these technologies succeed, as well as those who offer fresh insight into how technology can be deployed or how it will change our professional and private lives.

We also chose to pass on some well-known names in the network industry — people who often have a podium from which to espouse their ideas. Some of the people profiled here you'll recognize. Some you may not have encountered before. We hope you'll learn something from hearing their voices. We did.

In addition to the profiles, we asked some of our regular columnists to give us their Visions of the Enterprise Network in the "Envisions" columns that appear in this supplement.

As always, we welcome your views on our efforts and your Visions of the Enterprise Network. Enjoy.

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SAM SHULER

Dissecting technology

A tinkerer at heart, Texas Instruments' net strategist longs for lights-out management and more intelligent networks.

As a kid, Sam Shuler used to like to take things apart, which he says made for "a tremendously difficult time for my parents."

But times change, and now Shuler spends his time putting things together. Big things. Like a massive worldwide network that links nearly 90,000 terminals and workstations to 17 mainframes and is the lifeblood of Texas Instruments, Inc.

As manager of TI's electronics communications strategy, Shuler is responsible for mapping out the company's strategic networking direction. It is Shuler's job to select, test and implement the various products and services that make TI's net tick and to ensure the network keeps pace with its users' requirements.

It is only natural, then, that he has some definitive opinions on where the networking industry is headed and what kind of capabilities networks will be able to support in coming years. Those opinions range from an expectation that users will one day carry wrist-top communications devices that support wireless links to electronic or voice mail services and various databases, to his belief that cooperative, distributed net management is the best way to get to the lights-out management that he says is the ultimate goal.

Shuler says he views problems as nature's way of presenting an opportunity to excel.

With 23 years in the computer and communications business under his belt, Shuler speaks from experience.

His networking trek began before he graduated in 1970 with an electronic engineering degree from Hampton University, then Hampton Institute, in Hampton, Va. Even as a kid, Shuler says he was a "science fair fanatic," forever tinkering with one project or another.

In high school, he says he fashioned a homemade tesla coil, a device that creates "a miniature form of lightning," which, for example, makes florescent lights glow.

"It was tremendously exciting to plug the thing in, flip the switch and have your hair stand up on your head and the florescent lights glow. Of course, the neighbors were really upset because it knocked out all kinds of radio and TV reception for about a thousand feet," Shuler says.

While attending college, he worked summers at IBM and also worked for Big Blue as part of the school's cooperative education program. After graduation, he took a full-time job there.

At IBM, Shuler had the chance to work with a number of different operating systems and hardware platforms, from the old 1130 and 1800 systems to large VM and MVS mainframes. It was there he found his calling.

"The one thing I found in common among all of the things that I worked on, besides the languages, was the need to have these systems talk to each other," he says. "When I left IBM, it essentially stayed with me.

"That desire to make computers talk to each other has always held a certain amount of mysticism for me. There was always a magic in that whole arena for me that I couldn't get anywhere else."

Shuler says he views problems as nature's way of presenting an opportunity to do something different, to excel in some way. "That's what I'm all about."

Shuler left IBM in September 1981 for a 2½-year stint at ARC Automation Services, a division of Fireman's Fund Insurance Co., and ultimately wound up at TI in April 1984. He says he made the jump from the vendor to user community for the sake of diversity.

"One's orientation in terms of problem solving can be very tainted by operating in one paradigm all the time," he says. But Shuler's time at IBM helped sensitize him to a concern for the customer, which is now TI's 62,000 employees, and a need to couple technology with business objectives.

Shuler's aim is to provide an infrastructure that enables TI's end users to employ whatever applications they require and to ship data, voice and video wherever they need to. And such services need to be available at all times.

With network availability hovering around 99.65%, TI has come very close to that goal. The company is now in the process of building a new net management center and management system, based in part on Cabletron Systems, Inc.'s Spectrum, that is expected to boost that figure even higher.

Turn out the lights

In keeping with his role as overseer of strategic direction, Shuler says he saw changes in the net management landscape that caused him to rethink some basic tenets of his strategy.

"There was a time when I think we believed that you literally could build one system — a manager of managers — and have it, for all intents and purposes, do everything for you," he says. "Because you're looking at a very diverse set of systems, it's probably more appropriate to look at cooperative network management systems."

One thing Shuler says is missing from most management systems today is support for applications. "When you start looking at client/server architectures and distributed computing, how applications fit into the whole management structure is critically important."

By Paul Desmond

PHOTOGRAPHY STAN WOLENSKI

Shuler sees the Open Software Foundation, Inc.'s Distributed Computing Environment (DCE) and Distributed Management Environment (DME) as playing important roles in helping users solve such management problems.

"They are very good architectures to make an integration problem easier to solve," he says. "I think those vendors who truly listen to their customers will step forward aggressively with implementations that support the DCE/DME model."

That model says applications and databases should be able to reside on any system in a network and that any networked user should have access to all applications and data. From the management perspective, numerous managment systems, running applications written to common interfaces, should be able to share data and give users a cohesive view of networked devices and applications.

"It just greatly simplifies the whole environment," Shuler says. "And that's one thing I'm an advocate for — simplicity."

Automation is one way to provide simplicity and is a goal toward which Shuler continually strives. He is even credited with coining the term "lights-out network management," meaning networks that can be managed without human intervention.

"My assertion is there are no technical barriers to systems taking care of themselves," Shuler says. "If we could be there, then our levels of efficiency would rise significantly and the availability of services to our customer would rise exponentially. We aren't there yet. But we could be."

Such lofty goals will require more intelligence in various net components, but Shuler is confident such advancements are on the horizon.

For example, he talks of "an intelligent network infrastructure" that is "dynamic and elastic and smart in a number of ways." This infrastructure

(continued on page S5)

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(continued from page S3)

would consist of communications devices with the intelligence to allocate bandwidth to applications on the fly as needed. If a particular user's system needs 3G bit/sec of bandwidth at a certain time and the network has that amount available, the user will get it. If there is less than 3G bit/sec, the network will determine how much it can spare. The net will also be able to determine what service a user wants to access and use directories to find that service.

What kind of network device will have the intelligence to accomplish all that? Shuler makes an educated guess.

"I think the whole context of multiplexers, routers, smart hubs, modems and things of that sort that have been traditionally seen as separate and apart functions and boxes will collapse into one," he says. "I just feel very strongly that it's going to be a much smarter networking box than it currently is."

Again, Shuler says there are no technical barriers to building such a box today, although he says it will probably take five to 10 years. The main impediment, he says, is that users and vendors are tied to their installed base of equipment. But as evidence that a shift to such intelligent devices is already under way, Shuler points to the advent of hubs that have integrated bridging and routing capabilities and can support various types of local-area nets.

Coupled with this more intelligent network will be ever-increasing requirements for more bandwidth. TI, for example, already has multiple 45M bit/sec T-3 links in its network, and Shuler is not, by any means, convinced that this is enough.

"All the equipment necessary to create a significant demand for bandwidth is already in place," he says, noting that a 386-based, 33-MHz personal computer, for example, is capable of churning out data fast enough to run an Ethernet at 90% utilization. "Now it becomes a dice roll as to when the operating paradigm of either the applications or the users of these systems will shift such that the infrastructure is strained."

With this in mind, Shuler says it's important for users to plan for the long haul and think in terms of exponential — not incremental — network enhancements. "A good place to start talking is 622M to 1G-to-2G [bit/sec] worth," he says, although he admits there will be stop offs along the way, such as the Synchronous Optical Network Optical Carrier-3 rate of 155M bit/sec.

Calling Dick Tracy

Coupled with the demand for more bandwidth will be a requirement for ubiquity of service, or the ability to access the same information in the same fashion from virtually anywhere.

Two forces are driving the need for ubiquitous services: the advent of a more mobile work force and people working at home. Significant enhancements to current communications systems will be required to address the requirements of both types of workers, Shuler says.

"For example, I've got voice mail on my phone, but it's so dumb it can't tell me who left messages for me and when without my having to listen to the whole lot of them," he says.

Computer-based E-mail systems overcome that problem but have other limitations. "I can't just put a quarter in a phone and call my computer up and it says, 'Dear Sam, you've got three messages. Would you like for me to read them to you?' Now wouldn't that be tremendous?"

Shuler envisions the day when users will be able to not only retrieve messages from anywhere, but also be informed when important messages are waiting, regardless of where the user may be.

"If I'm walking down the hall and I've got my little, what I call a wrist-top, as opposed to a laptop, it ought to be able to let me know that I've got messages either sitting back at my desk or I should call in [to retrieve messages]," he says. "The concept of a subsystem in a wristwatch — a Dick Tracy-type thing — is just not far-fetched at all.

"Crazy, isn't it? But all these things are technically possible. I have seen products and capabilities such that none of what I've said so far is not within the reasonable realm of execution within the next three to five years," Shuler says.

Heady stuff. How, then, with such developments on the horizon, does someone such as Shuler ensure that his network plan is up to par with user requirements?

"First of all, I go to church on Sunday. I have the number of a priest with holy water, and I make sure I say my prayers.

"On the practical side, I continue to work with my vendors and carriers to get them to aggressively attack these problems," he says. "The only other choice I have is to build it myself, and I don't want to do that." ◆

Desmond is Network World's *assistant managing editor — news.*

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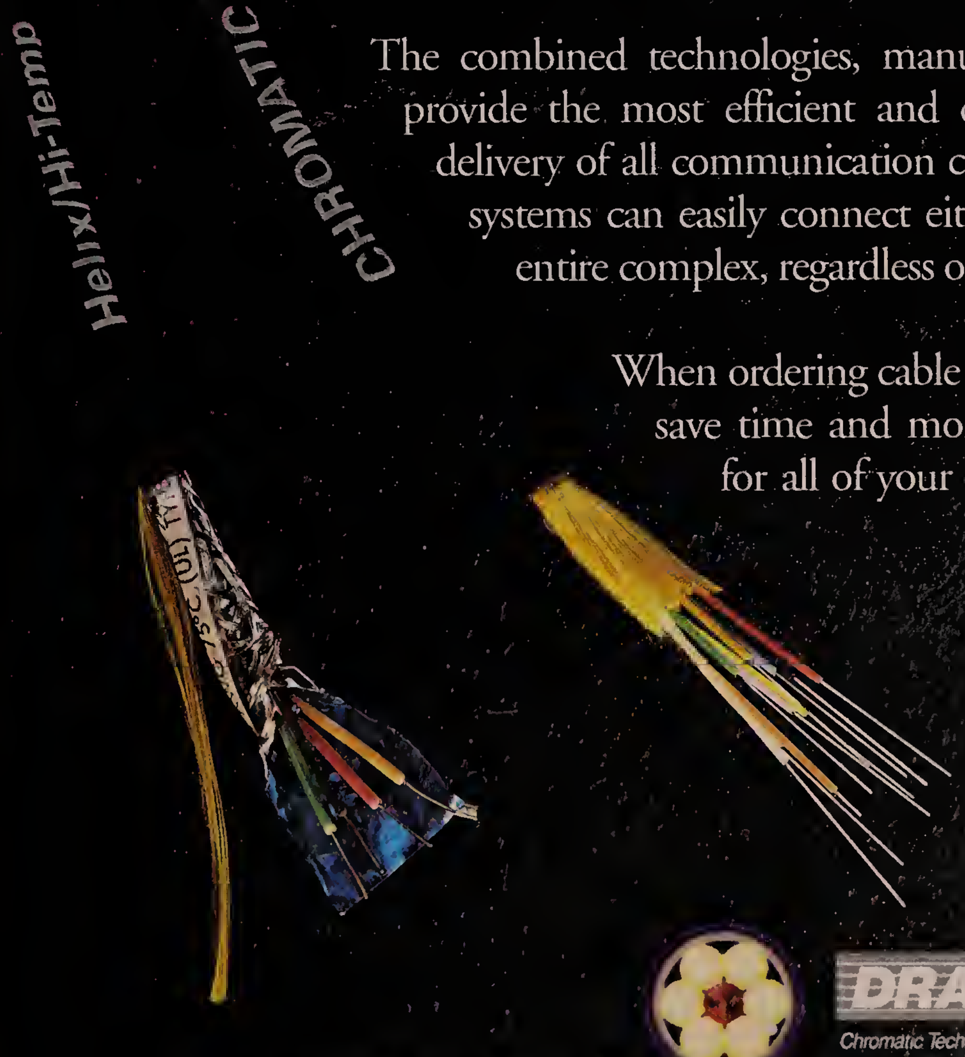

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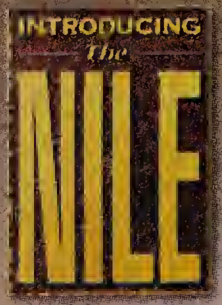

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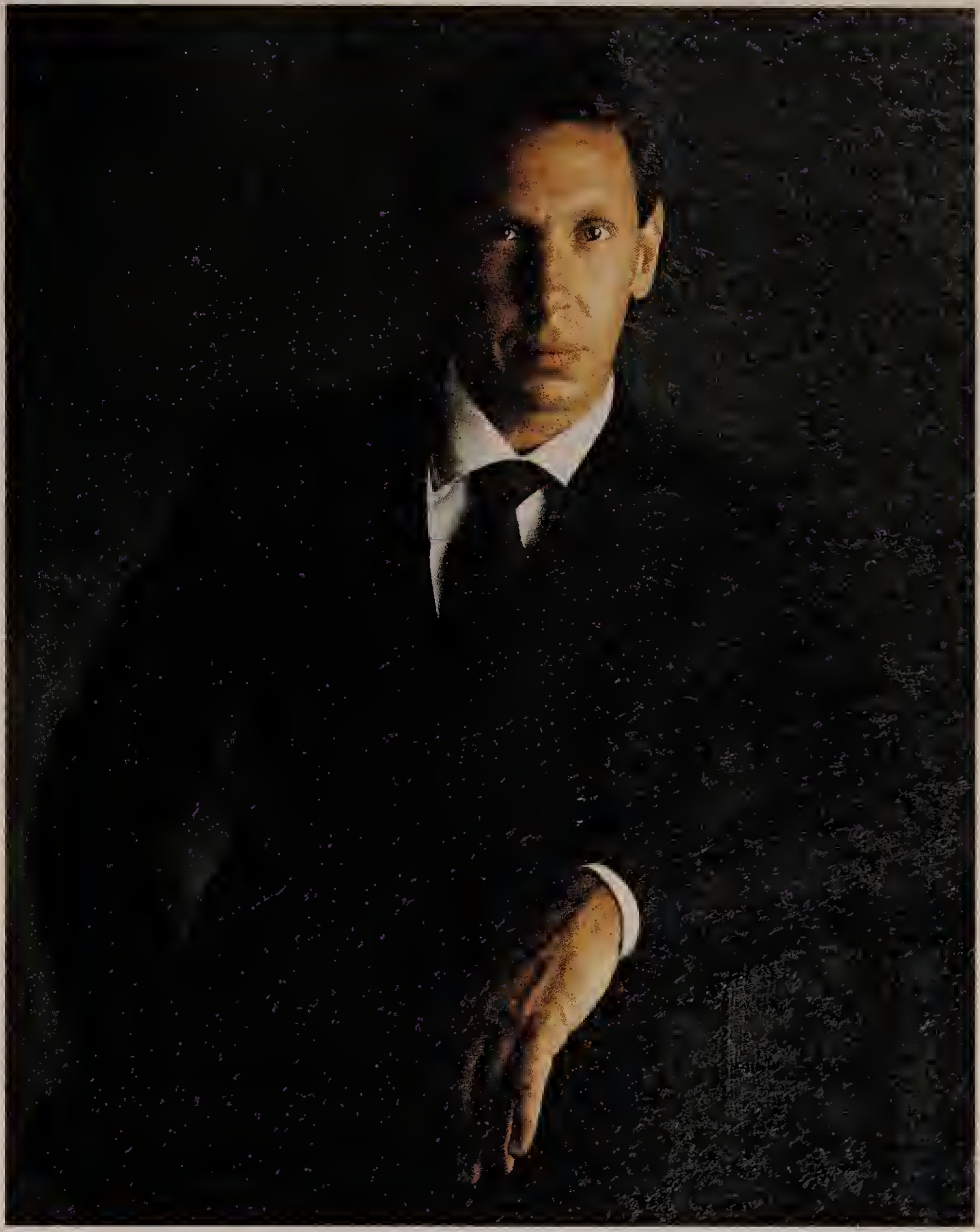
Circle Reader Service #16

Client/server is just the beginning

Oracle's founder is looking forward to the emergence of real distributed applications.



For Larry Ellison, chairman and chief executive officer of Oracle Corp., the view of the enterprise keeps getting better as it keeps getting more open.

Ellison cultivated Oracle's strategy of porting the industry's leading database to over 80 platforms and built the company into a billion dollar information software and services powerhouse. And he's welcoming the shift away from host-centric computing to enterprise networking and open data access.

"This fundamental shift in computing power away from the mainframe to the network will change the size of the database market — making it much larger — and will increase the size of the overall software market as well," he says.

Ellison attributes Oracle's growth to the premium the company places on portability and standards. An early adopter of the SQL language, Oracle aggressively ported its product to almost every computing platform — from mainframes to personal computers.

Another key to Oracle's strategy is an emphasis on distributed computing.

Oracle offers the only relational database management system product that runs on Apple Computer, Inc.'s Macintosh, while at the other end of the scale, it is one of the few relational databases for IBM mainframes.

Oracle, which was founded in 1977, wanted to stake an early claim in the relational database market. But the company's success caught even Ellison by surprise.

"At the time, we had no way of gauging our potential," Ellison says. "Today, Oracle is over-a-billion-dollar software company, and we will be a multibillion-dollar software company fairly soon. There is no question that we greatly underestimated the potential of this business."

Ellison says another key to Oracle's strategy is an emphasis on distributed computing, giving client machines the ability to transparently access any server on the network.

"We think the only good network is a totally invisible network, and there should be software working to provide the illusion that all the data is stored on one computer," he says.

In order to achieve that, software vendors need to make things that are different look the same. Dissimilar net protocols, operating systems and graphical user interfaces must look the same from the programmer's point of view.

Ellison believes programmers will need tools to provide this kind of transparent functionality if they are to be successful in the next decade building applications that run over multiple protocols and operating systems.

"Any client should be able to talk to any server, regardless of the protocol or operating system," Ellison says. "If the network is the computer, as Sun Microsystems, [Inc.] says, then someone has to make the network as easy to use as the computer."

Ellison believes Oracle's latest release of its database, Version 7, along with its communications and development tools, go a long way toward achieving that goal — at least for the programmer and the end user. Now that same level of functionality needs to be provided for the network manager.

"The whole issue of distributed database management and administration is a harder problem to solve," Ellison concedes.

Providing tools for management is a top priority for database vendors if they want to help users fulfill the vision of implementing distributed applications on an enterprise network. Those products will be needed both for existing tools and those based on emerging standards such as the Open Software Foundation, Inc.'s Distributed Management Environment.

Ellison says cautious users today are making the migration to distributed computing in phases, with the first phase being the acceptance of client/server computing.

"Client/server computing — many workstations tied to a single server — is really making some progress and will grow very rapidly over the next five years," he says. "But it will take what we call cooperative server computing — the ability for a client to easily talk to

(continued on page S8)

By Timothy O'Brien

(continued from page S7)

any server or collection of servers in the network — for distributed computing to be truly possible."

Ellison points out that the real limitation of existing client/server systems is dependence on a single server. In terms of server reliability or access to data on other machines, many of these systems still don't measure up to mainframe systems.

That's where true distributed computing comes in. By spreading data over multiple servers, a single point of failure can be avoided. And, in Oracle's view, it should be as easy to add servers to an application as it is to add clients, according to Ellison.

A positive trend is the emergence of a new generation of high-end Unix machines that are so fast, with some even boasting multiprocessing or cluster computing configurations, they are rivaling mainframes in the scope of their processing capabilities.

Ellison believes distributed computing will be enabled by the combination of these new machines and open systems software that can exploit them.

"Once you provide this capability to add servers, you have great scalability, well beyond what a mainframe can do," he says. "Plus, if one of the servers breaks, you're not out of luck. You continue to run and still have access to your data."

In fact, Ellison insists that database applications running on multiple servers already provide better scalability, reliability, useability and performance, all at a lower cost than mainframes can deliver.

"Open systems hardware is now as fast as mainframes, and Oracle Version 7 software makes the network easy to use," Ellison says. "The combination of the two will hasten the demise of the mainframe.

"The success of open systems is very important to Oracle's growth since Oracle today is the world's largest open systems software company," he claims. "The majority of our business continues to be in Unix, which makes us the largest software company in the Unix market — more than twice as large as our nearest competitor."

Ellison is targeting the high-end of the market, competing with mainframe software in the area of mission-critical, enterprisewide applications. He says the company will be paying a lot of attention to what IBM calls "reliability, availability and serviceability."

That's where Oracle's size is important. Service is key to supporting this new class of distributed applications, and Oracle boasts a worldwide service organization that spans 92 countries and continues to grow. "We have to have a certain scale to be trusted with an enterprise application," he says. "We have to be as good at transferring technology as we are at developing technology."

Oracle's investment in making its database portable across many platforms and protocols has resulted in the development of a tremendous amount of non-database-dependent systems and communications software — essentially, its SQL*Net offering. Oracle is considering leveraging this software as a separate product in new markets, such as the middleware arena.

Ellison says Oracle will also look at other types of technologies, such as remote procedure call or asynchronous messaging, that could be delivered rapidly to many platforms through this underlying systems and communications software.

"We do have some very interesting underlying technology, and we are likely to unbundle it from the database and make it generally available," he says.

Ellison sees force for change in the industry coming from the gradual merging of relational database technology with object-oriented database technology.

"I'm an object-oriented bigot, but I think object-oriented databases will be a bigger breakthrough than even object-oriented programming languages," Ellison says. "Our plan at Oracle is to over time go from SQL to Object SQL."

Overall, Ellison expects that the growth in the database market over the next decade could be "unbelievable."

He says the first generation of databases were corporate databases on mainframes. Then there were private databases on PCs. In this decade, he says, public databases will emerge that will consist of huge automated libraries of information. The need for database technology will be greater than ever.

With corporations around the world going through major reengineering of corporate information systems, Ellison is optimistic many of these companies will turn to Oracle for software that can be used to create the next generation of applications.

"We're riding the wave," Ellison says. "We're the leader right now, and we expect to increase our market share in this whole area, especially as corporations move from tactical systems to strategic and enterprisewide systems." ◆

O'Brien is West Coast bureau chief at Network World.

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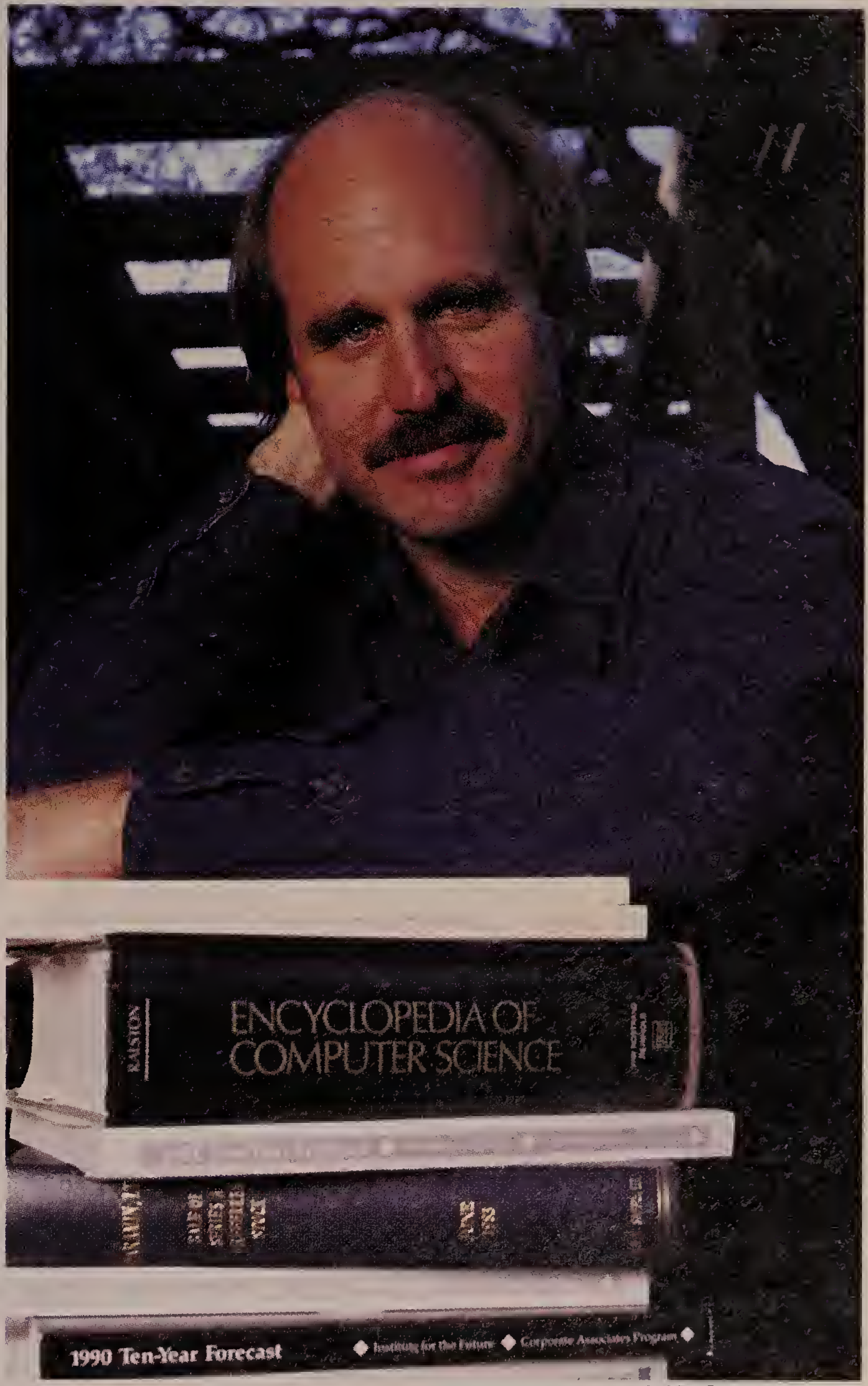
Circle Reader Service #8

PAUL SAFFO

Will networks kill the corporation?

Institute for the Future fellow discusses the decline of the PC, the rise of virtual corporations and the perversity of change.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PHOTOGRAPHY CINDY CHARLES

Paul Saffo thinks for a living.

The 38-year-old Institute for the Future (IFTF) fellow wonders, ruminates, speculates, cogitates and prognosticates about how information technologies will affect the way we do business, work and play in years to come.

"The short answer is that [networks] will change everything," says Saffo, from the nonprofit think tank's "postindustrial park" headquarters nestled in a quiet, wooded hillside of Menlo Park, Calif.

"In the next five years, networks will be supporting a shift to business teams from individuals as the basic unit of corporate productivity," Saffo says. "In the 10-year time frame, we'll see changing organizational structures. In 20 to 30 years, we'll see a shift so fundamental, it will mean the end of the corporation as we know it."

That prediction may seem a bit drastic for a society still arguing the merits of automated teller machines. But Saffo insists that we've already started down the path to the sort of pervasive interconnectivity that will give rise to a whole new "virtual" corporate structure, and in ways we can never imagine or predict.

Death of the PC

Not a "black-letter mathematician," Saffo looks to more anecdotal evidence. Two indicators, he says, are the personal computer and the Internet.

"The Internet has to have the worst interface of any single system on the planet," Saffo says. Yet it continues to grow at about 15% per month, according to some estimates, "because it's so useful and there's such a terrible hunger for information highways now."

The personal computer, on the other hand, has already begun a transformation from processing to accessing, a transformation that Saffo argues will eventually obsolete the traditional personal computer in favor of hand-held information appliances and desktop communications computers.

"In the '80s, the devices on our desks were defined by what they could process for us," Saffo says. "Well now, in the 1990s, they are increasingly defined by what they connect us to. They're not processing engines so much as windows on larger information worlds."

Saffo points to Apple Computer, Inc.'s PowerBook notebook-sized Macintosh computers as a prime example of this shift. Using a remote access program, called AppleTalk Remote Access, PowerBook users can connect to an AppleTalk network as a virtual remote node. In this way, their remote view of the network is exactly the same as it is locally.

That trend will become more pronounced with the advent of wireless hand-held devices, high-speed networking technologies and more stratified and complex client/server systems, Saffo says.

"Client/server is really just a big food chain, and all sorts of people are arguing about whether the client/server model fits or not," Saffo says.

However, he imagines a sort of fractal client/server relationship in which a base of specialized network servers feeds application servers, branching out eventually to the link between a hand-held communications device and a desktop machine.

"By the end of this decade, the devices on our desks will be more like telephones in the same sense that an unconnected telephone isn't a telephone at all. It's a paperweight," Saffo says.

Hidden question marks

"All neologisms like groupware have a hidden question mark after them because they are shorthand for asking a question," Saffo says. "In this case [the question is], Can personal computers be interpersonal devices?"

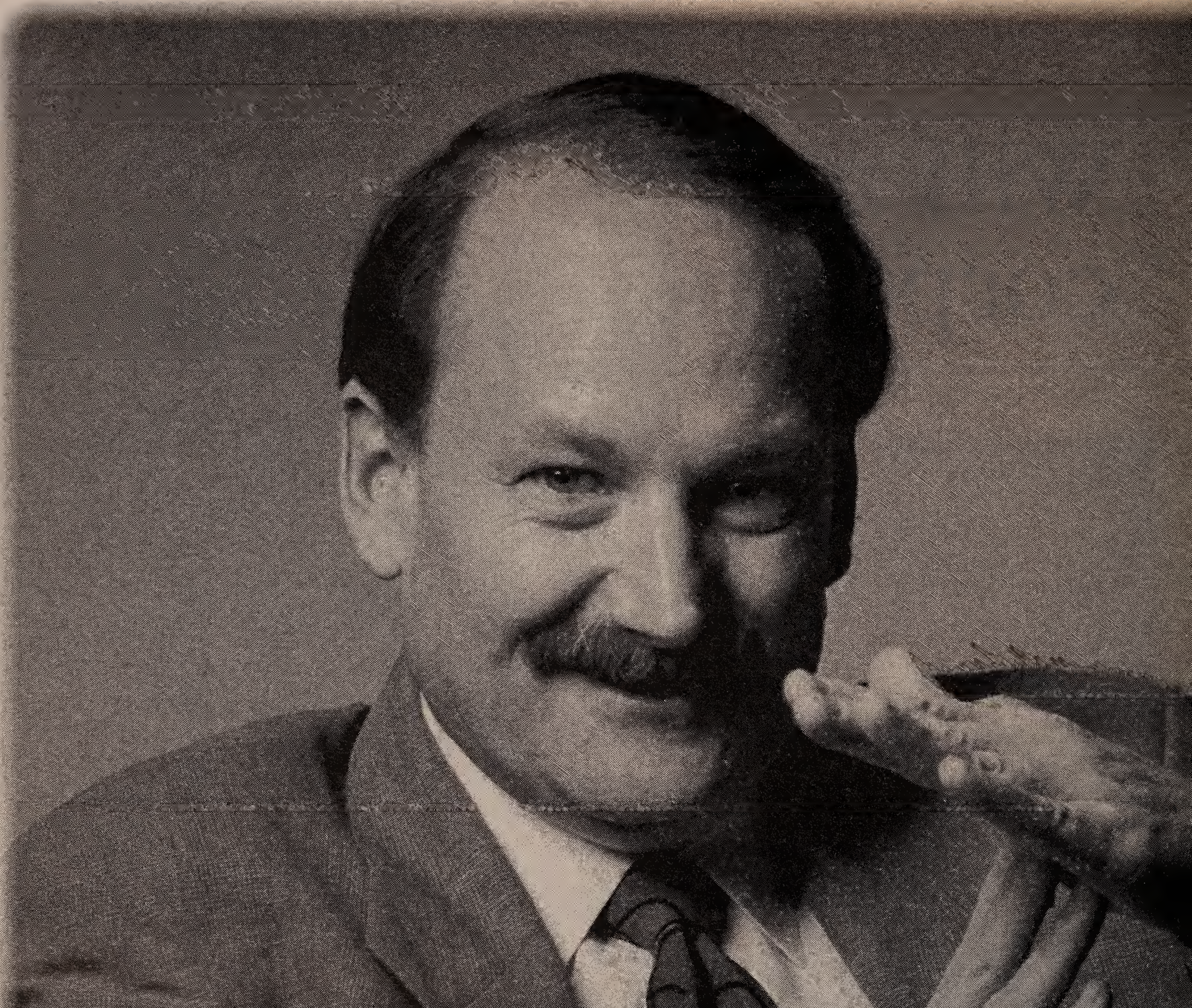
The IFTF has been studying that question from the vendor point of view for about nine years and from the user perspective for four years. The answer, according to Saffo, is yes.

Coined in the early 1980s, groupware is a word that has shown amazing adaptability, according to Saffo. It's an adaptability that will carry the semantics, if not the intent, into the next five years, when groupware will help teams become the basic unit of a business.

For example, Mutiple User Dimensions (MUD) systems will allow users to create "virtual offices," a concept that transcends any current definition of groupware.

(continued on page S12)

By Margie Wylie



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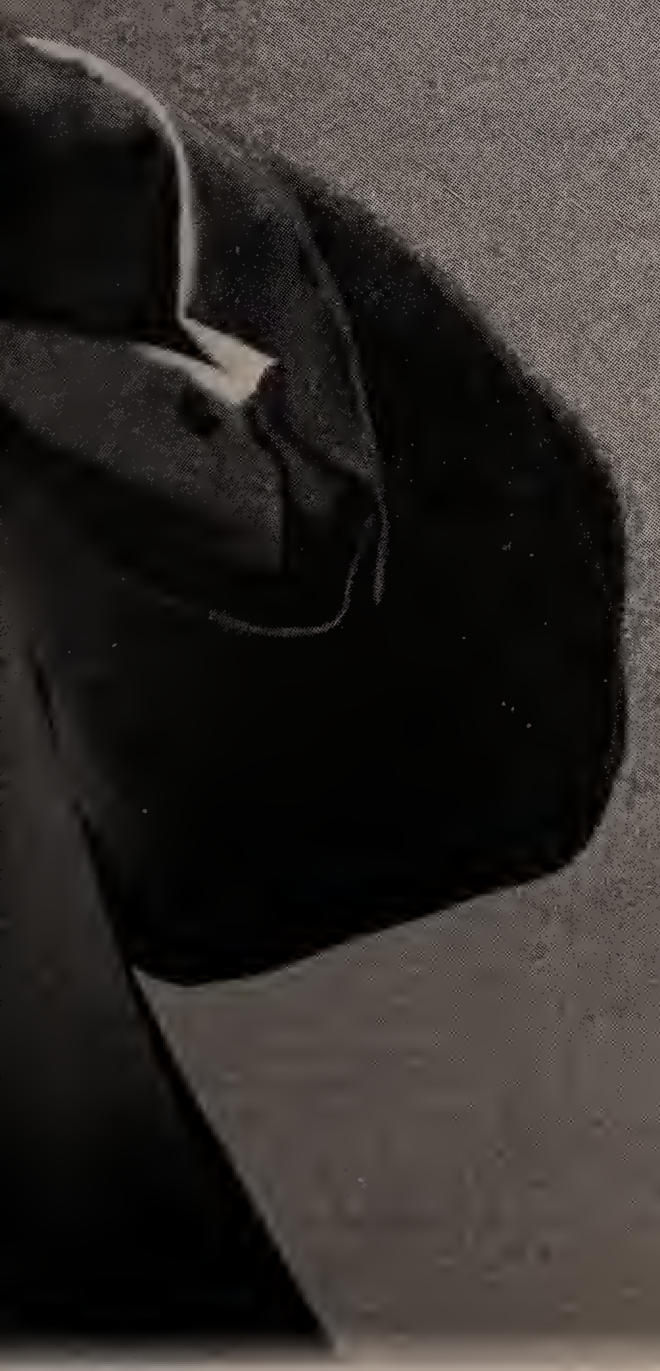

Most IT professionals tell me they would prefer to work with a strong network integrator rather than buying from many independent product suppliers. And yet, they buy bridges, routers, adapter cards, smart hubs and network management, etc., from dozens of suppliers. Why? Because they equate picking an integrator with having to settle for second rate technology. The only way out is to buy networks in pieces and shoulder the nasty job of integration alone. Time-out! At Ungermann-Bass, we don't think choosing between the "Best of Breed" and "One Stop Shopping" is a choice you should have to make. That's why we're the first networking company to combine leading edge products with leading edge integration. At Ungermann-Bass, network integration is just as important as technology. Now you can have the "Best of Breed" from a single source. If your company would benefit from a business partner who is as obsessed with the performance of your network as it is with product innovation, call Ungermann-Bass at 1-800-777-4LAN.

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(continued from page S9)

MUD systems grew out of a multiuser environment created for role-playing games, such as Dungeons and Dragons. The text-based system allows users to log into an environment, perhaps a set of offices, where they can interact with other users on the system.

Saffo sees the day when graphical MUD systems will be used as virtual office environments. People will be able to gather in a room and hold a meeting looking at the same graphics, spreadsheets or blueprints. Or they may just pop into the virtual office of a colleague for a chat, even though that coworker is physically on the other coast.

The next step, as foretold by Harvard management doyen Peter Drucker, is the end of the corporation as we know it, Saffo says. As information becomes more pervasive, corporations have to find newer, faster ways to react, and that means the end of the hierarchical organization, Drucker contends. That will be the beginning of the “virtual corporation,” Saffo says.

“Every generation deals with [information] overload by developing new metaphors for assimilating information,” Saffo says. The invention of the book in the 1400s, dual-entry accounting in the 1500s, even the application of chaos theory to the stock market in the 1990s show how mankind deals with ever-increasing volumes of information, he said.

And so will the corporation — and the worker — of the future have to find new ways to sort, disseminate and absorb more information than ever.

On the personal level, the hand-held communications device will play a big role, according to Saffo.

“I will not know or care how it talks to things. When I'm in my house, it's talking over the CT-1 [cordless phone standard] network through the phone to my office,” he says. “When I leave the house, it sees that there is no CT-1 signal around, and it goes into regular cellular telephony using the new digital data standard.

“When I'm not in a cellular zone, it switches on its iridium contact and talks via satellite. And when I walk into the office and throw my jacket on the table, it falls out of my pocket and detects infrared signals in the room, and it starts talking to my desktop computer,” Saffo says.

On the corporate level, Saffo thinks the utter availability of information and the interconnectivity of systems will give rise to virtual corporations, companies whose bounds will meld, separate and recombine quickly to reflect new information.

A modern-day example is the Ocean Spray label of cranberry juice, Saffo says. It is actually produced by a consortium of cranberry growers masquerading as a monolithic corporation.

Large companies may soon appear as a collection of smaller companies whose boundaries are almost indistinguishable. For example, a company's sole business might be to supply seats for a carmaker. That business could be tapped directly into the carmaker's order-entry system, may use its accounting computer and could maintain common facilities.

From the outside, the business would appear to be part of the carmaker. But every time a car seat is passed from one part of the facility to another, it would change title, with nothing other than electronic records to witness it.

“The companies that are going to survive are the ones that are very flexible,” Saffo says. “They are going to have to be able to shed layers of organization and adapt to new technologies very quickly.”

But he stops short of saying what technologies users can expect their organizations to be using. He doesn't know.

The perversity of change

“Even the first-order impacts of a technology are hard to predict,” Saffo says. The result is that we can see the direction that society is going, but we can never predict how we'll use the technology to get there, an effect that Saffo gleefully labels “the perversity of change.”

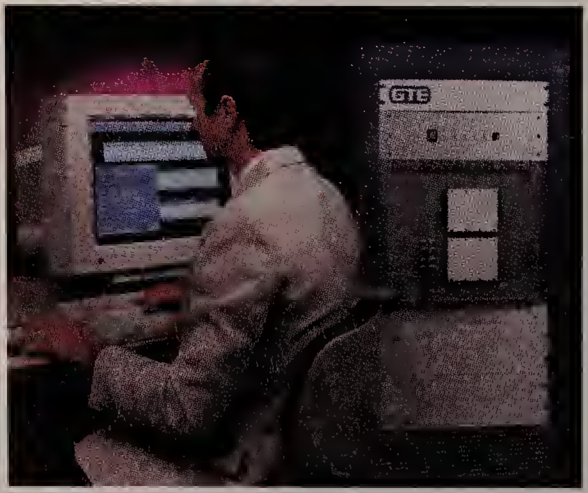
“There's this myth that technology drives change,” he says. “Technology absolutely does not drive anything. Technology enables change, it creates options and opportunities that as individuals or societies or whole cultures, we decide to take up and use or to ignore completely.”

For example, to help stranded motorists, the California Department of Transportation has installed cellular phones at stationary call boxes about one mile apart on some freeways.

“We associate wireless to mobile environments. But here's wireless supporting mobility by remaining absolutely stationary,” Saffo says.

“When the future finally comes to pass,” he says, “it will be everything we hoped for but seen through Alice's looking glass.” ◆

Wylie is a San Francisco-based freelance writer who specializes in networking and communications topics.



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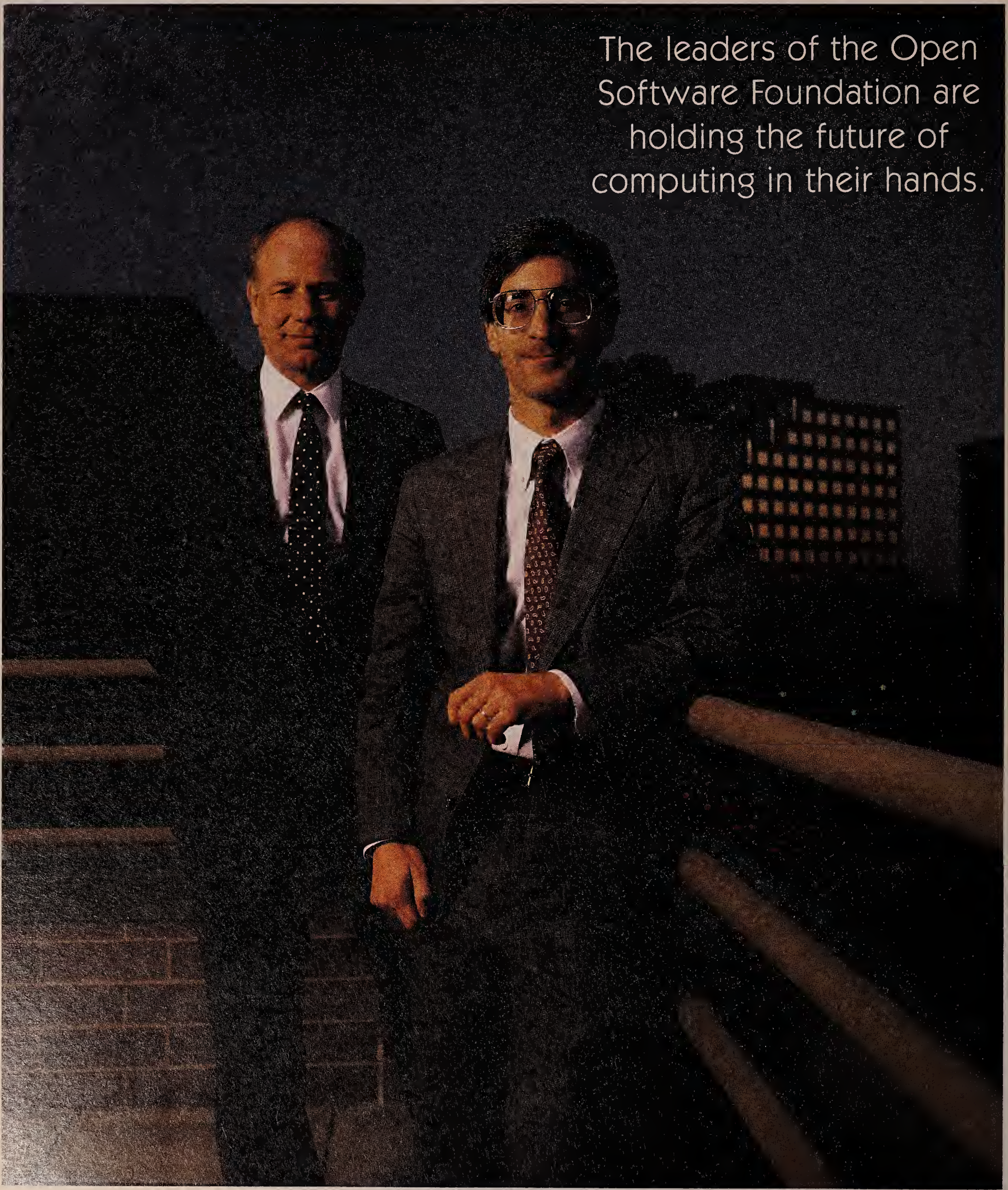
Circle Reader Service #1

JON GOSSELS and DAVID TOREY



The leaders of the Open Software Foundation are holding the future of computing in their hands.

PHOTOGRAPHY BILL O'CONNELL

Interoperability is Job 1

What's the vision that drives you as leaders of Open Software Foundation, Inc.?

Torey: When I was first approached to become the CEO of OSF, I thought it was a joke. I had been very public in my skepticism about the underlying reasons for the creation of OSF.

I eventually agreed after refusing the job three times over a six-month period. I realized the companies — the IBMs, the HPs, the Digitals and the European companies — supporting OSF were absolutely committed to providing a common platform for portability and interoperability.

I wanted to make that platform happen for the [independent software vendors]. I see this as a mission to provide open systems solutions for the software industry so they can provide solutions back to the marketplace.

Gossels: My definition of open systems is different [from that of many other people]. My definition is: Customers in control, choosing the solutions and the technologies they want. I didn't come at it from Unix at all.

I was seeing the real motivation for open systems: customers saying 'I want this to work together to solve my business problems.' When I heard about OSF, with $120 million in the bank and the resources to solve some very hard problems, it was a unique opportunity.

How has the vision changed since you started?

Gossels: The public perception of the mission has changed. The actual vision has been very consistent. The outside world perceived OSF as very Unix-oriented. But we had a much broader focus on interoperability and portability from the beginning.

Are you close to realizing it?

Torey: From a technology point of view, we are very close. We have delivered the first layer, the [Distributed Computing Environment], the distributed services the software industry [needs]. [Users] can build on top of it without having to incorporate those things in their own applications.

The next stage is to provide systems and network management services that make use of that underlying layer. We are on plan [with Distributed Management Environment]. We have defined what we are going to produce, and we are in the middle of producing it.

OSF has established credibility. When we say we are going to produce something, people start making plans for it.

What have you learned? What has surprised you?

Torey: How successful we've been. I thought this was going to be the most incredible political process and the biggest challenge was going to be — notwithstanding all the philosophical words of support from [John] Akers and [Ken] Olsen — actually establishing an independent organization that would provide solutions that were of such value they would override the vested self-interests of companies that were intensely competitive in a marketplace that was changing rapidly.

We've been very successful at finding that commitment to open systems in the face of that vested self-interest.

> We've been very successful at finding commitment to open systems in the face of vested self-interest.

Gossels: [Another] surprise is the technology absorption cycle — what is realistic to expect. Many of us came into OSF with a model that product life cycles tend to be 18 to 24 months. But OSF is earlier in the food chain, this isn't just the next bell and whistle on an established technology. The technology absorption cycle from start to finish is closer to 36 to 48 months. It really takes time before it moves from the research lab through OSF through the system vendor or software company, which adds value to it and integrates it with its own solutions before the end users see it in volume.

Torey: The senior management of the various companies hadn't really thought about what would happen if we were successful.

They had the feeling that OSF could create a technology, a very complicated and sophisticated technology, and in the space of 24 months, we'd have so much money coming into us, we wouldn't know what to do with it all. They didn't really understand what OSF was. We are a research and development lab working to provide leading-edge technology to solve problems that are only just now being understood.

Do the people who founded the organization now find themselves in the uncomfortable position of racing each other to implement what you've developed?

Gossels: We look favorably on that. They're touting the advantages of being first to market with OSF technologies, and they are getting a commercial advantage. They are seeing a pent-up demand for these technologies, which fuels the fire.

Torey: But you also sometimes have three or four companies standing on the edge of a swimming pool, and we say '1-2-3 jump.' One jumps and the other three say, 'Is it cold in there?' I have to spend more time pushing them in at the same time.

You describe here a process of vendors cooperating. There is a widespread perception in the user community that vendors remain focused on proprietary solutions and only move toward open systems when absolutely forced.

Torey: They're talking to their sales forces. Sales forces are selling today's solutions. We are dealing a year, two years, three years ahead. A salesman won't last long if he says 'Look, don't buy my technology today, but in two years, we'll have this great solution.' Users are always going to be confused by what account execs tell them.

Gossels: There is a very real gap between what a typical end user sees — they are just being pitched by the systems vendors — and where those vendors are going long-term. You are starting to see the leading edge of the bell curve of true open systems being delivered today. But the vast majority of systems being purchased are traditional.

What is the single biggest factor keeping users from moving to a distributed environment?

Torey: One of the biggest stumbling blocks is this clear dichotomy between

(continued on page S16)

By John Gallant

Who better than the sailor and the builder to guide the Open Software Foundation, Inc. (OSF) in the 1990s?

President and Chief Executive Officer David Tory, an avid sailing enthusiast, has had to navigate through some tricky political waters, getting OSF's intensely competitive vendor members to agree on an open systems course for the future.

Tory joined OSF after serving as a member of the senior management team at Computer Associates International, Inc. (CA), which he joined in 1977 when CA bought the software distribution company, Carus Ag, that Tory founded in 1971.

Appropriately enough, Jonathan Gossels, OSF's business area manager for interoperability, holds a general contractor's license. Gossels and his multivendor team are building the interoperability platforms — the Distributed Computing Environment and the Distributed Management Environment — that will support future networks.

Before coming to OSF, Gossels honed his expertise in net management at Codex Corp., which he joined after serving in marketing and research and development roles with Wang Laboratories, Inc.

Only four years old, the OSF has already had a dramatic impact on the industry. The group, whose other projects include the Motif graphical user interface and OSF/1 operating system, has won support from virtually every major vendor.

In an interview with Editor John Gallant, Tory and Gossels talked about challenges facing OSF, the glut of "open" architectures and open systems groups, and what users must do to benefit from open systems. ◆

(continued from page S15)

the network gurus and the systems gurus. You have operating systems driving computers and you have network systems driving networks, and never the twain shall meet. You had this problem with the MAP/TOP users and OSI. Everyone was focused on the network.

People have to realize that this is one problem, not two different problems. You've got communications people and you have computer people. But you have technologies like FDDI that can make two totally separate computers operate as though they are two chips in a single box.

Gossels: The whole premise of DCE is that you have to put the management of the computers and the network onto a common technology base. It is one problem: It has to be solved coherently.

From an IS manager's viewpoint, what do I need to do to drive my organization to open systems?

Torey: One very simple thing is defining a procurement policy — even better if it is a common policy with your colleague in company XYZ down the road. The IS guy uses his muscle to tell his vendors that he will only buy solutions that satisfy this set of procurement requirements.

Gossels: Previously, systems vendors dictated how the pieces were plugged together. Open systems is a change in the power relationship between the end user and the vendor. Open systems is about end users controlling their destinies, being in charge of what gets purchased and installed and mandating that the vendors make sure it works together well.

Why don't more people do that?

Torey: There is an awful lot of baggage of companies being used to the idea that their account execs determine what boxes and software they buy, because the account control mechanism has been going on for 20 years. It is the IBM senior execs being able to call up the CEO of a company to say 'Your MIS director has made a terrible mistake, fire him.'

Gossels: The absolute first step is that end users have to recognize they have a responsibility in this. There has to be a recognition that in an open systems world — the customer is in control. They have to develop a technology plan, they have to develop migration strategies and they have to codify it into procurement specifications so that every purchase moves them in the right direction.

Torey: Users are much more computer literate today, but there still seems to be a lack of confidence about the ability to force change.

Gossels: Adopting open systems is a long-term propostion. The ones that are going to have a competitive edge are the ones that start early, develop a plan and stick to it.

Why didn't OSI prove to be the answer to the types of issues you are trying to solve?

Gossels: Lack of consistent implementations, standards that were not based in reality or on proven technologies that address real life concerns like performance, amount of memory and bandwidth. They just weren't practical. Our approach is to take the best available technologies and integrate them. Our final solution will work. It is not just a stack of paper.

Users are confused today with all these open computing architectures vendors are announcing — Microsoft with WOSA, Apple with VITAL, IBM with its blueprints and plans. Do all these things fit together?

Gossels: The first thing users should do is open the window and blow out the smoke. There is remarkably little content in some of those architectures. So many of those architectures are just self-serving. You have to listen with a skeptical ear and listen for what they are not saying.

The major system vendors — their architectures are meaningful. I don't discount SNA because they are deploying it today, they have customers with all kinds of different systems and they are solving real business problems.

When you get to a company like Microsoft, which has been a desktop-only provider and has no experience in terms of an overall enterprise system, proposing these integration architectures, I just think it falls apart.

What role will object technology play in distributed computing?

Gossels: Object technology is going to be important for the industry long term. But you have to look pragmatically at what it can do for you today vs. what it is being hyped as doing. It is being grossly oversold. We are using a lot of object technology in DME, but we have had to extend the

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specification in the [Object Management Group's] Interface Definition Language so multiple implementations of DME on different machines would interoperate.

DCE is more service-oriented than object-oriented. We don't have a security object, we have a security service. That isn't to say that someday, when object technology is mature enough, we won't evolve DCE services to look like security objects or directory objects. It has the internal structure but not the trappings. It's way too early to glue on the trappings.

Are there too many organizations involved in open systems today?

Gossels: There are a series of groups which do very good work. OSF is not against the formal standards process; we support the formal standards that are good and we adopt them and we implement them in our systems. There is an ongoing role for the ANSI and ISO committee work.

Organizations like X/Open [Company, Ltd.] have a role to play, perhaps different than the role they think they should play, but a legitimate, ongoing role. Even the OMG, even though their specification today is incomplete. I don't fault them for that. It is a good first step, it is just not far enough along to be the de facto standard before it has ever been proven to work.

The [Network Management Forum] played an important part in the past doing object definition work for net management. They have probably completed that role, and I think the [Open Management Interoperability Point] is so much noise. Being able to point to 96 standards, half of which conflict with each other — I'm not sure what that does for anybody.

Where they have done the work defining the communications device objects, the DME will support that.

Where I have a problem with consortiums is the premise that open systems equals Unix, and if it isn't Unix it isn't open systems. I think that is crap. If the user can buy it from any vendor and have it interoperate seamlessly, that is what they are looking for, no matter what the operating system is.

How did the perception arise that open systems equals Unix?

Gossels: Part of it was a very insightful ad campaign Sun launched in the '88 time frame. They said 'We are Berkeley Unix-based and anyone can get the source code; therefore, we are on the most open technology base.' They've come 180 degrees from that, where it is not open unless they sell it. That [Unix equals open stance] was adopted by AT&T, which was selling System 5 Unix. [Unix International] is legitimately the user group for System 5. But let's not confuse that with the broader issues to be solved in the industry.

What will the information technology environment, which you are helping to define, look like in corporate America in five years.

Torey: There will be an awful lot of what you see today. Ninety-five percent of the market is reactionary and conservative. What is driving us is a group of leading-edge, Fortune 100 companies that have invested enough to understand that they need to make much better use of their information technology infrastructure.

Within that Fortune 100, what will the environment look like?

Gossels: I don't see a dramatic phase change in the industry. I see continued proliferation of very high-speed computing devices, devices getting smaller, cheaper and faster. Multiprocessing systems will be the norm.

You will continue to see increasing bandwidth of communications. In modern computing environments, you can't separate the computing from the network. All enterprise computing systems are networks of computers.

What I see in that five-year time frame is increasing diversity of computing devices. There has been a lot of talk of common operating systems. But the strategic view OSF took four years ago was to accept that systems software is going to be different depending on the job you are trying to do. The engine in a truck is different than the engine in a sports car.

End users are going to take advantage of these highly differentiated computing devices with specialized systems software. But the end user will be buffered from all that complexity through a very robust middleware layer.

While the underlying devices are getting more complex, the ability to use them in a distributed environment will get easier and easier.

How has OSF's Request-for-Technology process worked in practice?

Gossels: It is premised on the experience with OSI, where you got a bunch of smart people in a room that created standards that were unimplementable and had no proven technology that worked. [RFT]

(continued on page S48)

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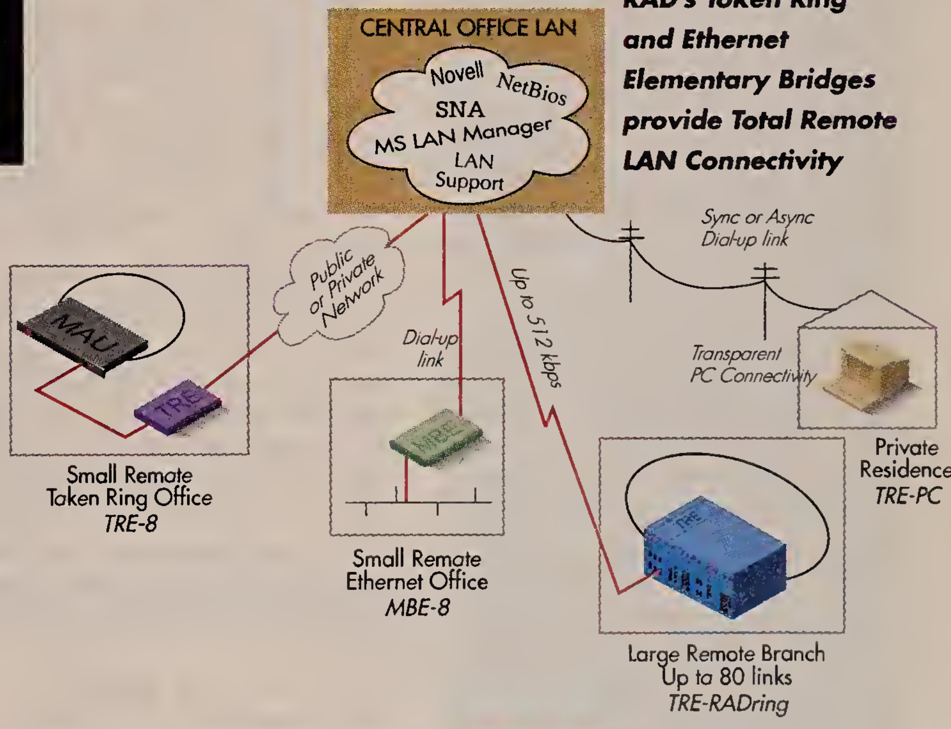

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MITCH KAPOR

Fighting for justice on

Mitchell Kapor started the Electronic Frontier Foundation (EFF) with colleague John Perry Barlow in 1990 as U.S. law enforcement agencies were conducting the Operation Sun Devil search-and-seizure operations against individuals and vendors accused of committing or abetting computer crime.

EFF's founders believed the U.S. Secret Service had overstepped its bounds in some cases, taking steps that threatened to set legal precedents limiting freedom of expression and privacy in a digital environment.

Created as a public-interest group to ensure civil liberties and Constitutional rights are protected in the area of electronic communications, EFF quickly became a forum for debate on a variety of issues.

EFF has entered the fray in Washington when Congress or federal agencies contemplated actions that would affect the network industry or user rights. For example, EFF last year led the coalition that derailed the Federal Bureau of Investigation's proposed wiretap legislation in the 102nd Congress.

Through the platform of EFF, more than 35 computer and telecommunications companies united against the FBI's proposed Digital Telephony and Interception law, which would require the redesign of network equipment to enable the agency to carry out surveillance activities over digital net facilities.

In an interview with *Network World* Senior Correspondent Ellen Messmer at EFF's Cambridge, Mass., offices, Kapor — the founder of Lotus Development Corp. — discussed the issues taking shape on the electronic frontier — issues ranging from privacy and security in a networked world to the need for an improved U.S. network infrastructure.

What was the reason for the creation of the Electronic Frontier Foundation?

The world is changing technologically, and there's no agreement about how it's changing or what is going to happen in the world and in society as a result. We're wiring together the world piecemeal.

But I don't think there's much doubt that eventually we're going to be wired together into some form of global network, through which will flow information and communications not restricted to any one type of activity or sector of society.

Business will be done through it, and people will communicate their interests, their fears and their loves to their friends and family. It will be the successor to the voice and data networks that we see today.

In that context, there are a lot of issues that arise: Who's going to own and control these networks? What kind of a climate are they going to represent for both the enterprise and for free speech? What will happen to our existing notions of privacy and security in that type of world?

EFF was created as a public interest organization, not beholden to any particular set of private interests, that is going to help explore that electronic frontier and help bring about the creation of a world and a public policy which we'll all be proud to live in, rather than regretful.

Having said all that, there were some incidents that got us out of the thinking stage and into the doing stage. [They had] to do with the collision between computer bulletin board users and law enforcement officials in the summer of 1990, as well as the civil liberties issues raised about the future of the First and Fourth amendments and questions of the rights of bulletin board operators and users compared to, say, print publishers.

That not only mobilized us on a whole number of civil liberties issues but also on issues having to do with infrastructure: the creation of a national public network, access to some kind of digital capability for every home and office and debates about copper vs. fiber as well as cable/telephone competition and the future of the telephone industry as a whole.

Have the civil liberties issues raised by the law enforcement actions in 1990 been resolved?

Some issues have been resolved favorably; some issues go on. Nothing is ever definitely settled in law.

But the fact is that we were living at that time in an atmosphere of mutual ignorance and suspicion between the network pioneers and law enforcement. But that is much less true today. There is dramatically improved communication, which we helped bring about.

As a consequence of that, there has not been a repetition of the flagrantly abusive law enforcement behaviors that we saw.

There were some cases in which, in the absence of any clear-cut commitment to civil liberties, there were problems. And there's still some litigation going on about them because it's necessary to establish a constitutional basis for the protection of expression.

But what's changed is the climate — [these issues are] no longer so hotly contested. There's a real need and a willingness on the part of bulletin board operators, users, and law enforcement and policy people to sit down and try to talk out how this part of cyberspace is going to work.

In fact, we're now running a term-limited, invitational on-line computer conference of a very distinguished set of attorneys and computer board operators, and representatives of on-line services and electronic publishers to try and grapple with some of these issues, to get some definition for the law of bulletin boards in conferencing.

> "We were living in an atmosphere of mutual ignorance and suspicion between the net pioneers and law enforcement."

That's just the beginning. We want to generate an agenda and move this out into a more publicly visible arena.

What are some of the other issues of concern to EFF?

The question of public infrastructure is a critical issue — by which I mean that common set of facilities that everybody might have access to in order to communicate.

Today, we have the public switched telephone network. The bandwidth isn't high enough, and it's analog — not digital — hence, it's unreliable.

And it's nonstandardized. No matter which part of the world of interfaces you look at, there's no standardization in them.

You can't build a skyscraper out of balsa wood, and you can't build services on top of [plain old telephone service].

Everybody knows this. That's why businesses invest in private lines, and there's a lot that a company that just wants to talk to itself can do. And they're doing that — 75% of *Network World* is about that.

But we're focused on the other 25%, in part because that's what needs attention. There's a kind of regulatory nightmare and political gridlock. We stepped in to say, How can we avoid falling farther behind our neighbor nations that do policy in a different way and have some kind of coordinated effort, whether you're talking about Singapore, Japan or Germany?

We need to first talk conceptually about what sort of thing we ought to be like, and then we can talk practically about how to do it. If we don't have a clear idea of what the goals are, then there's no point in funding programs or providing regulatory relief.

A problem with the visions of the future has been that they are technologically glamourous but not always well thought through. People talk a lot about the need for fiber to the home and a national broadband network. While I have no doubt that is ultimately where we'll end up, how we ought to get there and what we ought to be doing with it has gotten astonishingly little discussion.

People just assume — I hear this repeated hundreds of times by non-technologists — that in order to deliver advanced health and education services you need fiber to the home. This is hooey!

If you had ubiquitous ISDN, given the advances in digital video compression — current and future — you could do full-motion video to every home. You could turn every home into a classroom; you could do real distance learning.

My point is, for certain applications you don't need broadband.

We're concerned with the public policy of ISDN, such as availability and tariffs. Our criterion is whether you can

By Ellen Messmer

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19. ☐ Interconnects
20. ☐ Manufacturers (Computer/Communications)
21. ☐ VAR/VAD/VAN/ Systems Houses
22. ☐ Distributors, Computer Related
23. ☐ Distributors, Communications Related
24. ☐ Other_______________________________

2 What is your job function? (check one only)

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3. ☐ Datacom/Telecom Mgmt.
2. ☐ LAN Mgmt.
4. ☐ Engineering Mgmt.

MIS MANAGEMENT

5. ☐ MIS, IS, IT Mgmt.
6. ☐ Engineering Mgmt.

CORPORATE MANAGEMENT

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8. ☐ Consultant (Independent)
9. ☐ Other_______________________________

3 My responsibilities include: (check one only)

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3. ☐ LANs
5. ☐ None
2. ☐ LANs/ Internetworking
4. ☐ WANs

4 What is the total number of sites for which you have purchase influence? (check one only)

1. ☐ 100+
3. ☐ 20 - 49
5. ☐ 2 - 9.
7. ☐ None
2. ☐ 50 - 99
4. ☐ 10 - 19
6. ☐ 1

5 What is your scope and involvement in purchasing decisions for network products & services for your enterprise?

A. Scope (check one only)
1. ☐ Corporatewide
2. ☐ Multienterprise (consultants)
3. ☐ Departmental

B. Involvement (check all that apply)
1. ☐ Recommend/Specify
2. ☐ Approve
3. ☐ Evaluate

4. ☐ None (A or B)

6 Check all that apply in Columns A and B:

A. I am involved in the purchase of the following products/services.
B. I plan to purchase the following products/services in the next year.

Involved / Plan to Purchase

A B **LOCAL-AREA NETWORKS**
☐ 01. ☐ Local-Area Networks
☐ 02. ☐ LAN Servers
☐ 03. ☐ LAN Operating Systems Software
☐ 04. ☐ Superservers
☐ 05. ☐ Data Base Servers (Oracle, Sybase, etc).
☐ 06. ☐ Terminal Servers
☐ 07. ☐ LAN Services
☐ 08. ☐ LAN Storage Devices (optical, tape, disk, etc,. including backup systems)
☐ 09. ☐ Network Test Equipment
☐ 10. ☐ Hubs
☐ 11. ☐ Cables, Connectors, Baluns
☐ 12. ☐ UPS
☐ 13. ☐ Network Adapter Boards
☐ 14. ☐ Peer-to-Peer LANs
☐ 15. ☐ Wireless LANs
☐ 16. ☐ SNMP Network Management
☐ 17. ☐ ATM (Asynchronous Transfer Mode)

A B **INTERNETWORKING**
☐ 18. ☐ Bridges
☐ 19. ☐ Routers
☐ 20. ☐ Gateways
☐ 21. ☐ Bridge/Routers
☐ 22. ☐ Hubs
☐ 23. ☐ Intelligent Hubs
☐ 24. ☐ Communications Servers

Involved / Plan to Purchase

A B **COMPUTERS/PERIPHERALS**
☐ 25. ☐ Micros/PCs
☐ 26. ☐ Minis
☐ 27. ☐ Mainframes
☐ 28. ☐ Pen-Based
☐ 29. ☐ Laptops
☐ 30. ☐ Workstations
☐ 31. ☐ Image Processing Workstations
☐ 32. ☐ Front-End Processors
☐ 33. ☐ Terminals
☐ 34. ☐ Printers
☐ 35. ☐ Cluster Controllers
☐ 36. ☐ Fax Machines
☐ 37. ☐ X-Terminals

A B **SOFTWARE/APPLICATIONS**
☐ 38. ☐ Network Management
☐ 39. ☐ Micro to Mainframe
☐ 40. ☐ Security
☐ 41. ☐ Communication/Terminal Emulation
☐ 42. ☐ Word Processing
☐ 43. ☐ Operating Systems
☐ 44. ☐ Business Applications (Finance/Mfg/HR)
☐ 45. ☐ Applications Development
☐ 46. ☐ Data Base Management
☐ 47. ☐ Spreadsheet
☐ 48. ☐ Groupware
☐ 49. ☐ EDI
☐ 50. ☐ E-Mail
☐ 51. ☐ Windows/Graphical User Interface
☐ 52. ☐ 4GL/Development
☐ 53. ☐ Multimedia
☐ 54. ☐ Graphics
☐ 55. ☐ Utilities

A B **WIDE-AREA NETWORK EQUIPMENT/SERVICES**
☐ 56. ☐ Modems (9.6K bps and over)
☐ 57. ☐ Modems (under 9.6K bps)
☐ 58. ☐ T-1
☐ 59. ☐ T-3
☐ 60. ☐ Fractional T-1
☐ 61. ☐ Data Switches
☐ 62. ☐ SMDS
☐ 63. ☐ ATM (Asynchronous Transfer Mode)
☐ 64. ☐ Matrix Switches
☐ 65. ☐ Packet Switches
☐ 66. ☐ Protocol Converters
☐ 67. ☐ Diagnostic/Test Equipment
☐ 68. ☐ DSU/CSUs
☐ 69. ☐ Microwave
☐ 70. ☐ Fax Boards/Modems
☐ 71. ☐ VSAT
☐ 72. ☐ Fiber Optic
☐ 73. ☐ Satellite
☐ 74. ☐ ISDN
☐ 75. ☐ PBXs (over 1000 lines)
☐ 76. ☐ PBXs (under 1000 lines)
☐ 77. ☐ Automatic Call Distributors
☐ 78. ☐ Voice Messaging Systems
☐ 79. ☐ Videoconferencing Systems
☐ 80. ☐ Voice Response/Processing
☐ 81. ☐ Switched Voice
☐ 82. ☐ Dedicated Leased Line
☐ 83. ☐ Switched Data
☐ 84. ☐ Centrex
☐ 85. ☐ E-Mail/On-Line Information
☐ 86. ☐ Image Processing
☐ 87. ☐ Audio Teleconferencing
☐ 88. ☐ Local Services
☐ 89. ☐ WATS MTs
☐ 90. ☐ International
☐ 91. ☐ Virtual Networks
☐ 92. ☐ Frame Relay
☐ 93. ☐ Value Added Services
☐ XX ☐ None of the above (1-93)

7 What is the total number of A: LANs B: Workstations/Nodes in your entire organization?

		LANs A	Workstations/ Nodes B
1.	5,000+	☐	☐
2.	1,000 - 4,999	☐	☐
3.	100 - 999	☐	☐
4.	50 - 99	☐	☐
5.	10 - 49	☐	☐
6.	9 or Less	☐	☐

8 Which of the following network platforms are currently installed/planned in the next year?

NETWORK ARCHITECTURES

Present Planned
☐ 01. ☐ SNA
☐ 02. ☐ DECNET
☐ 03. ☐ MAP/TOP
☐ 04 ☐ TCP/IP
☐ 05. ☐ DCA (Unisys)
☐ 06. ☐ X.25

Present Planned
☐ 07. ☐ NOVELL IPX/SPX
☐ 08. ☐ APPC/APPN/LU 6.2
☐ 09. ☐ NETBIOS
☐ 10. ☐ OSI
☐ 11. ☐ APPLETALK
☐ 12. ☐ OTHER_______________________

LAN OPERATING SYSTEM
☐ 13. ☐ LOCALTALK (APPLETALK)
☐ 14. ☐ BANYAN (VINES)
☐ 15. ☐ DCA (IRMALAN)
☐ 16. ☐ DCA (10-NET)
☐ 17. ☐ IBM (LAN SERVER)
☐ 18. ☐ IBM (PC LAN PROGRAM)
☐ 19. ☐ MICROSOFT (LAN MANAGER)
☐ 20. ☐ UNGERMANN-BASS (NET/1)
☐ 21. ☐ NOVELL (NETWARE, 2.X, 3.X, 4.X)
☐ 22. ☐ PROTEON (PRONET)
☐ 23. ☐ SITKA (TOPS)
☐ 24. ☐ 3COM (3+, 3+OPEN)
☐ 25. ☐ ARTISOFT (LANTASTIC)
☐ 26. ☐ HAYES (LANSTEP)
☐ 27. ☐ DEC (PATHWORKS)
☐ 28. ☐ OTHER_______________________

LAN ENVIRONMENT
☐ 29. ☐ 4M TOKEN RING
☐ 30. ☐ 16M TOKEN RING
☐ 31. ☐ ARCNET
☐ 32. ☐ ETHERNET
☐ 33. ☐ STARLAN
☐ 34. ☐ FDDI
☐ 35. ☐ LOCALTALK
☐ 36. ☐ 10BASE-T
☐ 37. ☐ OTHER_______________________

OPERATING SYSTEM
☐ 38. ☐ DOS
☐ 39. ☐ UNIX/XENIX/AIX
☐ 40. ☐ OS/2
☐ 41. ☐ OS/2 2.X
☐ 42. ☐ MVS
☐ 43. ☐ VM
☐ 44. ☐ VMS
☐ 45. ☐ MACINTOSH
☐ 46. ☐ WINDOWS
N/A 47. ☐ WINDOWS NT
☐ 48. ☐ X WINDOWS
☐ 49. ☐ OTHER_______________________

9 For which areas outside of the U.S. do you have purchase influence? (check all that apply)

1. ☐ Europe
4. ☐ Australia
2. ☐ Asia
5. ☐ Middle East
3. ☐ South America
6. ☐ None

10 Which of the following hardware platforms is installed/planned in your company? (check all that apply)

	Mainframes Currently Installed	Planned Next Year	Minis Currently Installed	Planned Next Year
01. DEC	☐	☐	☐	☐
02. IBM	☐	☐	☐	☐
03. AMDAHL	☐	☐	☐	☐
04. AT&T	☐	☐	☐	☐
05. BULL HNIS	☐	☐	☐	☐
06. DATA GENERAL	☐	☐	☐	☐
07. HP	☐	☐	☐	☐
08. TANDEM	☐	☐	☐	☐
09. UNISYS	☐	☐	☐	☐
10. OTHER_____________	☐	☐	☐	☐

MICROCOMPUTERS
(fill in the numbers)

	NUMBER INSTALLED	NUMBER PLANNED NEXT YEAR
11. MACINTOSH 20, 30, 40		
12. MACINTOSH OTHER		
13. PCs BASED ON 80586	N/A	
14. PCs BASED ON 80486		
15. PCs BASED ON 80386		
16. PCs BASED ON 80286		
17. PCs BASED ON 8086/8088		
18. RISC / UNIX BASED WKSTNS		
19. OTHER		

11 Estimated value of networking equipment and services:

A. Which you helped specify, recommended or approved in the last year?
B. Which you plan to help specify, recommend or approve in the next year?

A B
☐ 1. ☐ $100 million and over
☐ 2. ☐ $50 - $99.9 million
☐ 3. ☐ $25 - $49.9 million
☐ 4. ☐ $20 - $24.9 million
☐ 5. ☐ $10 - $19.9 million
☐ 6. ☐ $5 - $9.9 million
☐ 7. ☐ $1 - $4.9 million
☐ 8. ☐ $500,000 - $999,999
☐ 9. ☐ $499,999 or less

12 Estimated gross annual revenue of your entire company/institution: (check one only)

1. ☐ Over $10 billion
5. ☐ $50 to $99.9 million
2. ☐ $1 to $9.9 billion
6. ☐ $10 to $49.9 million
3. ☐ $500 to $999.9 million
7. ☐ $5 to $9.9 million
4. ☐ $100 to $499.9 million
8. ☐ $4.9 million or less

13 Estimated number of employees for your entire corporation:

1. ☐ Over 10,000
4. ☐ 1,000 - 2,499
2. ☐ 5,000 - 9,999
5. ☐ 500 - 999
3. ☐ 2,500 - 4,999
6. ☐ 499 or less

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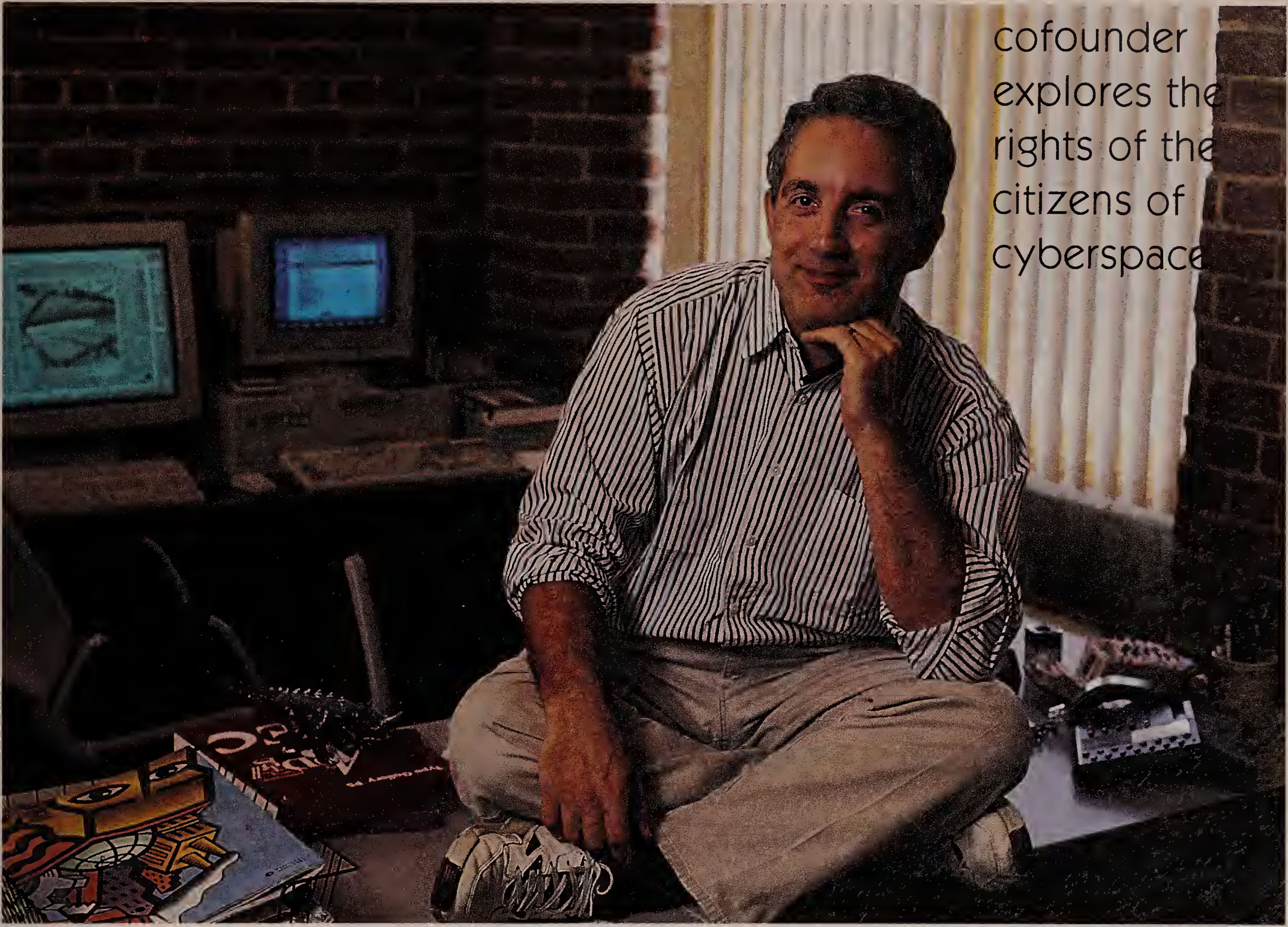

PHOTOGRAPHY BETSY BASSETT

call up and get it. We're also trying to bring about a change in thinking about infrastructure — and really a paradigm shift. The telecommunications industry historically hasn't asked the right questions. We're trying to re-frame the debate.

The message is platforms, well known in the computer industry. Put something out there that will stimulate third-party developers, something that is just good enough to get them started, cheap and ubiquitous. That is what will spur people to make the investments to develop the new services that create real demand.

That is not how the telecommunications industry thinks. A classic example: How much bandwidth do users need to do advanced services to the home? The answer is as much bandwidth as there is. This is because at one level of bandwidth, people will do one set of things with it, and, if you give them more bandwidth, people will do more with it.

So the point is not that there's some magic number; the point is there are these other criteria about whether the platform is widely available and whether it's affordable that have much more to do with creating the conditions that stimulate market growth. And this is just not understood.

On the question of privacy, what specifically are the issues there?

The question is what kind of privacy are we going to have in the networked world and how we are going to secure it.

You don't have to commission a public opinion poll to know that people are concerned with their privacy and further incursions on it, if you can see how people are reacting publically to everything from caller ID to credit bureau screwups.

The big issue, I think, is to recognize that we need to add some new technology to the mix to help ensure privacy. We need legal safeguards and appropriate technology, which, in this case, consists of various types of encryption — end-to-end and user-selected encryption.

For one thing, if business is going to use public computer networks, they need to be able to authenticate messages with digital signatures, and that's encryption-based. [The public] also sometimes wants confidentiality as well as the knowledge that casual eavesdroppers of one kind or another are not going to be able to profit from the transmissions.

As more and more people go mobile, the problem becomes infinitely compounded. You absolutely have to have encryption because the use of scanners and other things is so undetectable that the laws are unenforceable. So the issues are building encryption into these platforms, such as Privacy Enhanced Mail for the Internet.

And what about the Internet?

The Internet is just a big petri dish of social ferment. There are stages

(continued on page S20)

(continued from page S19)

of evolution.

One thing that's been happening for the last year has been the emergence of a commercial, restriction-free sector on the Internet. There's no point in being an electronic publisher if you can't legally get on the Internet and use it to distribute. And it's only been within the last year that that's started to change, and I believe we've now hit critical mass in that change.

So now it's necessary to tackle some of the higher level infrastructure issues. Two years from now, you will see a lot of commercial services on the Internet.

The Internet is wonderful because it is a kind of living laboratory and it is open. If someone has a good idea and puts it on the net, it's capable of being adopted very rapidly, such as [Wide Area Information Services] or GOPHER.

It's still hard to use, but that's changing. The client software is getting a lot better; it insulates you from the details of Unix administration. I hope more people will make successful businesses out of it.

There is still the possibility of wars breaking out because of agencies in the government bickering over stuff, like the Department of Energy and NASA vs. the National Science Foundation. It could blow the thing up or damage it. It could force a balkanization or create a scandal. I worry about this, but I think the Internet would survive all this.

If the Internet is really supposed to grow up and become the National Research and Education Network, what would be the ideal situation? Should the government really be involved in that and at what level?

If a networking technology is sufficiently mature that there are competitive commercial markets in each segment, the government should exit.

But I believe strongly the government should continue to fund a wide variety of basic research that is precompetitive in nature. That means funding developments in very-high-speed networking, that which is not commercial, not competitive. And I think we need to support the colleges and universities, and even K through 12 with Internet connectivity.

The way we do that should be the same way the government [provides] funds for university researchers to buy workstations: Get the grant approved, cut a check, and go out in the market and find what you want to buy. Shift to supply-side funding for subsidized users at universities.

The relevance of the subsidized single-backbone provider is already dropping because people are connecting around it. There are now 12 members of the Commercial Internet Exchange, now including the New England Academic and Research Network, the Bay Area Research Network and the John von Neumann Computer Network, and that stuff also passes completely around the subsidized backbone. The current arrangement is just becoming more irrelevant.

What's likely to happen with the new very-high-speed NSF Network backbone when it's finally deployed?

There will not be a single-production backbone a year from now. The backbone is for experimental uses, but every institution that cares about the real world is also going to be connected to somebody's real production network because there are issues of reliability and quality of service.

There's also been an extraordinary increase in global Internet connectivity, which is also backbone-irrelevant. There are several European networks on the CIX. There are more global non-U.S. networks coming in and connecting in ways that don't implicate the backbone. We still hold the position that access to the Internet ought not be distorted by the subsidized backbone.

The NSF recognizes this position because even the backbone re-competition has this concept of network access points that will enable interconnection into regional and other networks. That idea is very popular. It means you don't have to use the backbone and it means you can get to people without using the backbone.

What is the EFF planning for the future?

We're going to be involved for the next year on infrastructure issues. [President-Elect Bill] Clinton and [Vice-President-Elect Al] Gore are going to take a much more active interest and put forward much more leadership on the national level, and we would like to be a part of that process.

These cable/telco issues are not going to go away. There are issues of competition in the local loop for telephone service, how we get from narrowband to broadband and the genuine opening of the public switched network. These three things are all big policy/research issues for us. So we have these new issues to put on the plate.

On cable/telco, we support the notion

(continued on page S22)

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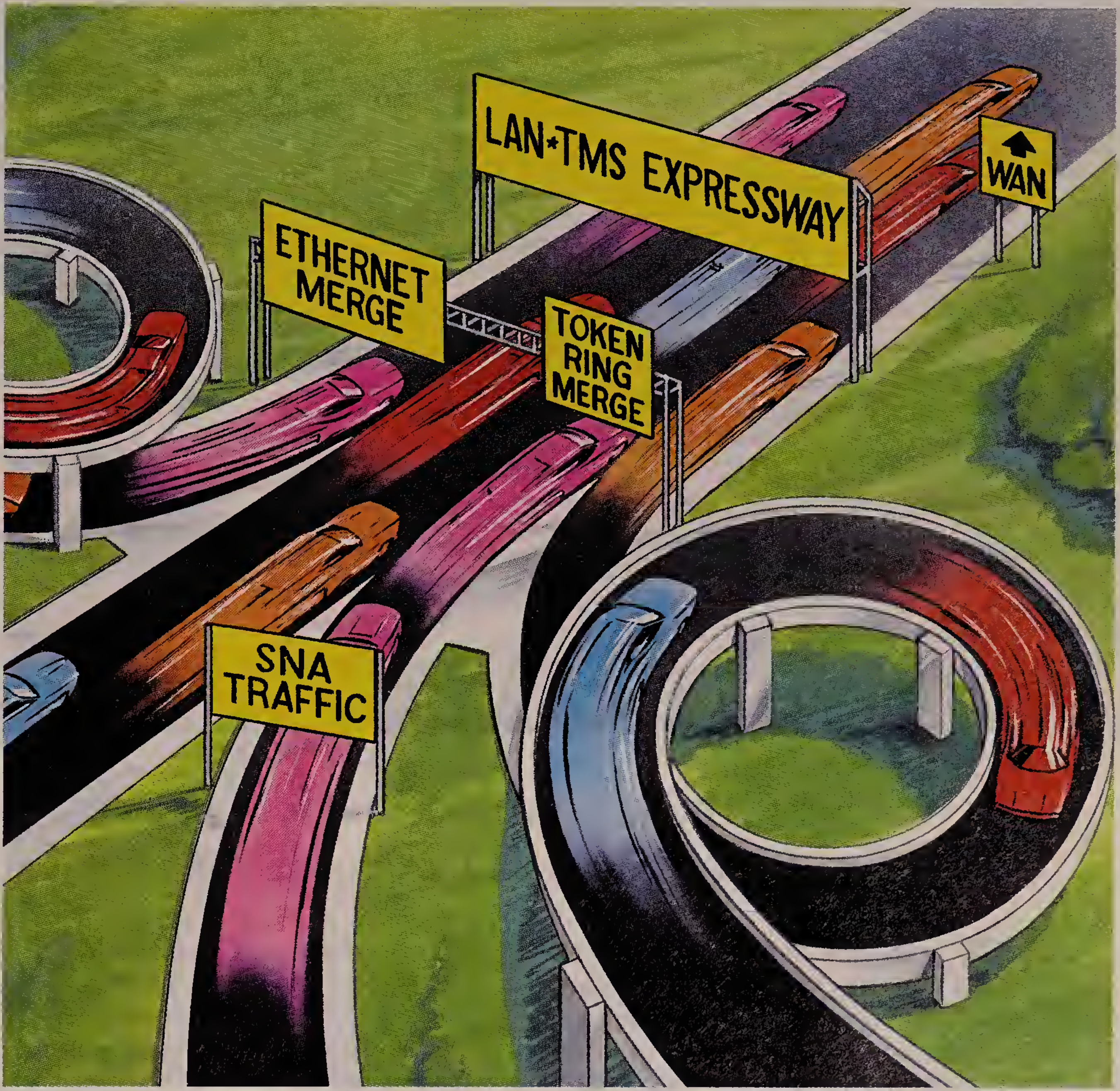

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SEE US AT NETWORLD BOSTON, BOOTH #1129, AND COMNET BOOTH #427

Circle Reader Service #5

(continued from page S20)

of competition, which means telcos' provision of video service. But our interest is on infrastructure for innovative new digital information communication services, interactive multimedia and so on.

The digital privacy coalition that signed the Federal Bureau of Investigation's Digital Telephony White Paper has also taken on its plate the encryption issue in relation to the [National Security Agency]. It's part of our program to facilitate dialogue and get industry, public interest and the NSA together and see what we can do.

EFF is only about two years old, but you've had significant success in bringing the telecommunications and computer industries together on issues, and getting the ear of Congress, as well. How are you doing it?

We don't just write papers. People roll up their sleeves down there [in the Washington office] and leap into the fray. We do a lot of trench work. It's a way to get things done.

We also bring a lot of technological credibility because of me. A lot of policy papers take good positions but they have no content; they don't know what they're talking about.

We do things that are technologically grounded and credible, so it tends to make it very practical. And it lets us get [companies] like Microsoft, IBM, Lotus and Apple involved, not only based on the technological component, but also on other parts of my background in the PC industry.

Those guys are the new kids on the block in Washington. They want to get stuff done, they're still building these big businesses. They're very pragmatic. It's a very healthy influence to have.

John Podesta of Podesta Associates, Inc. in Washington, D.C. helped organize the industry response to the FBI wiretap proposal. Wasn't EFF involved in that?

Well, we did that. John Podesta works for EFF as a consultant. The FBI Digital Telephony White Paper was EFF-sponsored. Thirty-seven companies signed onto it, but we initiated the organization and coordination of that task force, drove the analysis of the paper and got people to sign off on it.

John knows how this stuff works; he used to be the chief counsel to Sen. [Patrick] Leahy. And [the industry opposition] killed that legislation for the term. There will be more rounds of that, believe me. I'm sure the FBI will come back with a new piece of legislation.

It's a real problem. I don't think [the FBI] framed the problem properly. But our position is not that the FBI should deal with the problem [alone].

Figuring out how to enable them to carry out legitimately authorized wiretaps in a minimally intrusive and restrictive fashion is a real issue.

Their approach was clearly the wrong approach, but that doesn't mean there's no issue.

They know this, and they'll be back. We're committed not only to stopping them from doing the wrong thing but trying to help them do the right thing. We're in meetings with them and technical task forces.

The FBI says it hasn't been getting cooperation from the Bell telephone companies, those it says it needs most to conduct the wiretapping over ISDN.

The FBI says the Bell companies ignored them until it threatened legislation.

I believe there is a kind of pissing contest between the FBI and the [regional Bell operating companies] on this. The spillover of it is they're kind of saying to each other:

'Oh, yeah?'

'Yeah!'

'Oh, yeah? Well, we'll file legislation over this, you recalcitrant so-and-so's!'

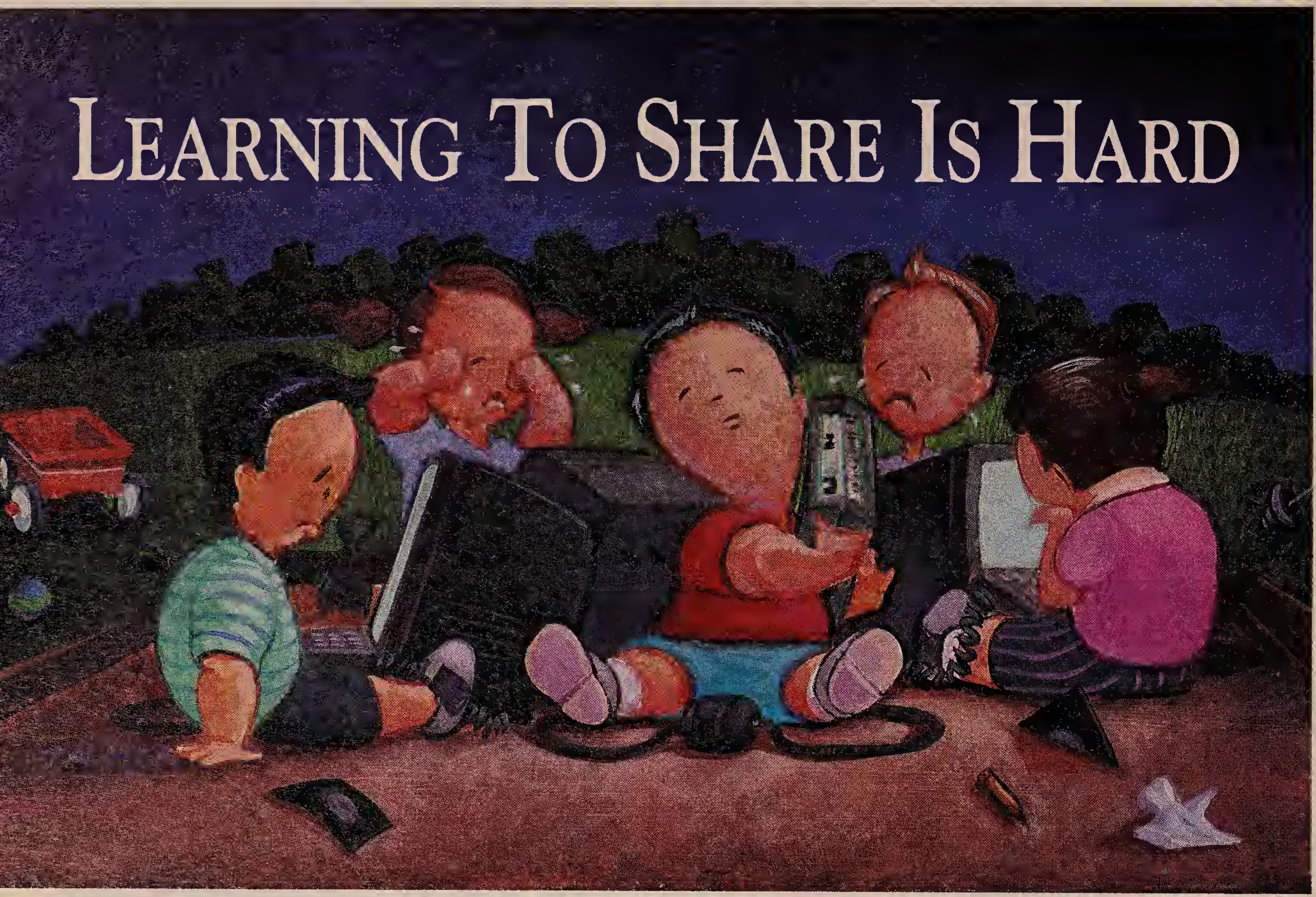
And that's how this legislation actually got started. The FBI just felt the Bells were not being appropriately cooperative. But [the FBI] made the mistake of taking the bait and implicating the whole computer industry in the thing. And that issue will be back.

This is a policy problem of who's going to do what and how much, and who's going to pay for it and how it will be controlled. But technically, the phone company has the ability to monitor conversations remotely. It's built into the software; they know how to do it.

They can extend that capability out to the FBI, and they might have to spend some money to do that. I don't know how much. But the issue is not focused on having to use that means to accomplish this without requiring the passage of legislation.

The whole dialogue has been absorbed into something much bigger. I don't think the FBI understood what they were doing. Now you have these 37 organizations unit-

(continued on page S48)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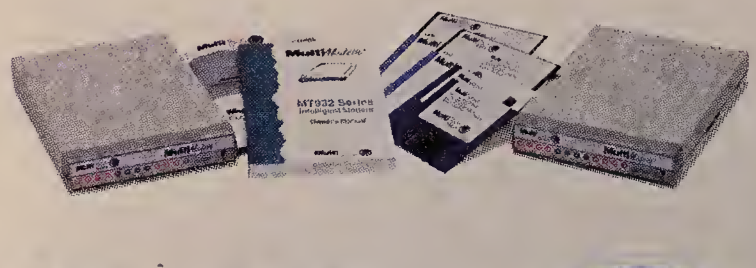
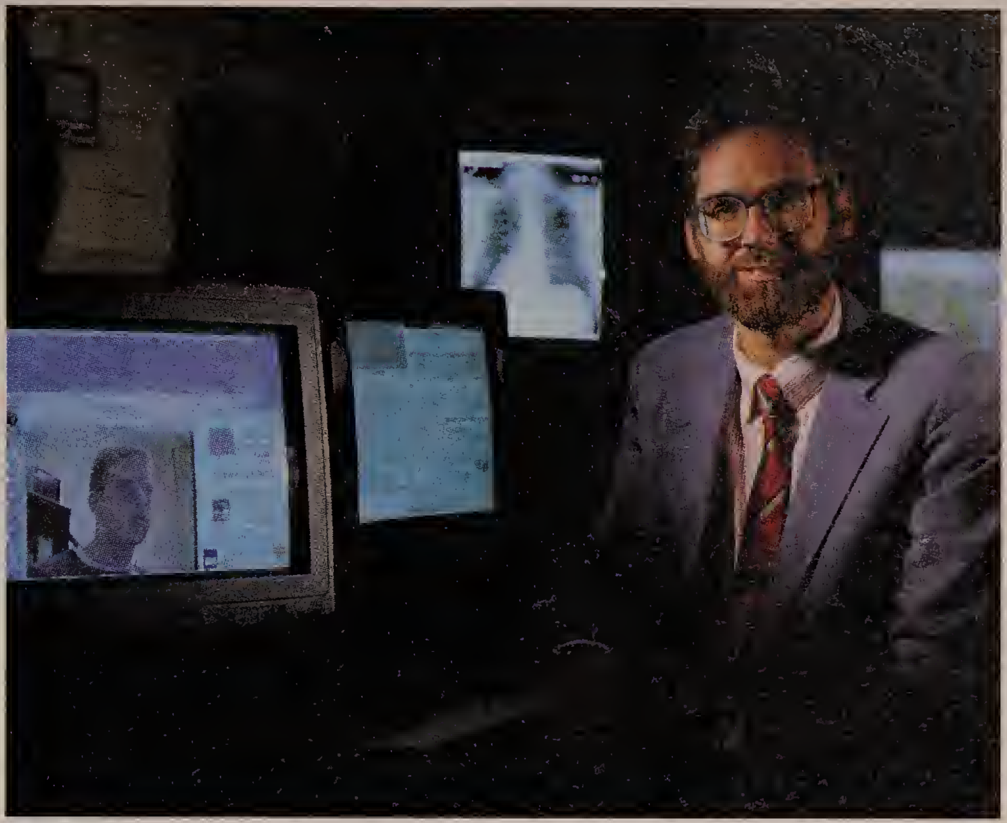


JONATHAN TURNER

Long day's journey into ATM



PHOTOGRAPHY JAMES VISSER

New high-speed net technology provides good theater for Washington University's computer science star.

Although he couldn't have foreseen it at the time, Jonathan Turner's interest in the technical aspects of theatrical productions in high school and college would set the stage for his life.

Nor could he have predicted that the play that would unfold on that stage would have a surprise ending.

Instead of ending up in theater, Turner today finds himself chairman of the computer science department at Washington University here and a leading researcher in Asynchronous Transfer Mode (ATM) network technology.

"After I started getting involved in the technical side of theater work, including building sets, designing sets and doing lighting, I realized that what was interesting me most was the technical work," Turner says. "That's when I started thinking about engineering."

To pursue that awakening interest, Turner transferred from Oberlin College in Ohio to Washington University, where he majored in electrical engineering and computer science.

After graduating in 1977, he went to work for AT&T Bell Laboratories in Chicago and soon thereafter started working toward his master's degree and later his doctorate in computer science at Northwestern University.

At Bell Labs, he ended up in an applied research group, working on what was then known as fast packet switching — the ancestor of today's ATM technology.

"The main objective was to build a network that could handle both voice and data in an integrated fashion," Turner said. "When we said fast packet, we meant 1.5M bit/sec. At the time, packet switches were 9.6K or 64K bit/sec and completely software driven."

But as the project picked up steam, Turner's interest waned.

"Bell Labs was a lot of fun in the beginning when there were only four or five people," he said. "By the time I left, there were about 50 people involved and it was tough for me to really have much influence on the direction of the project."

So in 1983, Turner returned to his alma mater as an assistant professor in the computer science department and, within a year, was involved with network research. "That wasn't my intent," he recalls. "But I got interested in the problem of how to build multipoint networks with multipoint virtual circuits."

The early work Turner did at the university involved networks running at 100M bit/sec and higher, speeds that convinced him to give up on variable-length cell technology being pursued at Bell Labs and go with fixed-length cells.

The next question was, What sized cells? Turner advocated use of 512-byte cells because it would make it easier to

(continued on page S24)

By Skip MacAskill and John Dix

(continued from page S23)

scale the technology up to gigabit speeds.

“Having large cells was advantageous because it gives you a reasonable amount of time to make routing decisions on a cell-by-cell basis,” Turner explains. “I thought it was best to pick the largest cell size that was reasonable at 100M bit/sec because it was clear that, as we scale up to gigabit rates, we do with large cells.”

“What we’ve tried to do here is recognize that writing papers is not enough if you want people to use what you do.”

But standards bodies — driven by telephone companies concerned about the efficiency of using large cells to support voice — ultimately won out, leaving a standard ATM cell of 53 bytes, 48 bytes of data and a five-byte header.

While he admits this is adequate for building ATM nets for the near term, what galls him is that the argument for small cells was driven by what he says is a fundamentally skewed vision of the future.

“If voice ever constitutes a large part of the traffic on ATM networks, then ATM networks have failed because there just isn’t enough bandwidth from all of the voice to have a significant impact in the ATM world,” Turner says.

In Turner’s model, ATM is most interesting when 155M bit/sec links are delivered to user workstations. So, even if those links are used to support two compact disc-quality voice channels taking up 1.5M bit/sec of capacity, that represents only a fraction of the available bandwidth. “If you think in those terms, it doesn’t make sense to optimize around the tiny little cell size,” he said.

Reluctantly, Turner adopted the fixed-length cell into his research efforts at the university, which by this time had begun to take off.

In mid-1985, he started up a consortium with Bell Communications Research and Italian telephone company IsaTel — which were later joined by NEC America, Inc. and Bell Northern Research — to do basic research and build integrated circuits for what was still being called fast packet technology.

In late 1988, the consortium started a project with Southwestern Bell Corp. and NEC to put together a prototype fast packet switch for a network demonstration.

“This is when we really got the level of support necessary to hire full-time staff and put the project on more solid footing,” he says.

Switch architecture

The ATM switch architecture that ultimately emerged from Turner’s lab described a silicon-based switching technology, an approach that Turner believes is more efficient than the shared-bus method some other ATM advocates are backing.

With Turner’s parallel switch architecture, four-port switching elements are used to route traffic through a multilevel switch fabric. The aggregate bandwidth of the switch is expanded as more switch elements are added.

It is harder and more costly to grow bus-based ATM products, he contends, because expanding bus capacity requires each port module to be reengineered to sit on the new wider bus.

“If you double the size of a bus-based switch and keep the same level of performance for each port, the cost of the system grows by a factor of four.”

In an interconnection network scheme such as Turner’s, the cost grows more slowly. “That’s one reason you don’t see bus systems larger than about 16 ports,” Turner says. “Even at 16 ports, it’s my feeling that they’re uneconomical.”

At least two vendors agree. In recent months, SynOptics Communications, Inc. and Ascom Timeplex, Inc. have cut deals with Washington University to use the switch architecture.

SynOptics is using the school’s ATM chip design for emerging ATM products, and Ascom Timeplex is working closely with Turner’s group on next-generation technology that can support 600M bit/sec port speeds and much larger switches. Ascom Timeplex has based a team of engineers at the school to work with university researchers.

“What we’ve tried to do here is recognize that writing papers is not enough if you want people to use what you do,” Turner says. “Companies find that just getting published research doesn’t tell them enough about what the real potential and limitations of a given set of research ideas are. If you don’t at least build a proof-of-concept system, you have nothing to evaluate.”

Next challenge

While the agreements with SynOptics and Ascom Timeplex are two of the bigger projects Washington University is involved with, Turner points to a third area that may be just as essential.

The school is working with Bellcore and Southwestern Bell to resolve some critical ATM signaling problems, including how to provide future services across multivendor switch platforms.

It is harder to grow bus-based ATM products, Turner contends, because expanding bus capacity requires each port module to be reengineered to sit on the new wider bus.

“One of the things you have to deal with in the virtual circuit network is setting up and tearing down virtual circuits,” Turner says. “When you have multipoint virtual circuits, that becomes a fairly complicated problem because you have an unlimited number of end points.

“While there are protocols that define how switching systems talk to signaling systems and so forth, every vendor has their own vertical stack of protocols,” Turner says. “It’s very difficult to make sure that the different stacks are consistent with one another and that they work with one another.”

The problem becomes even more complex with multipoint virtual connections because each cell transmitted has to be delivered to a number of other points over different virtual circuits.

“Implementing that right-of-way is hard even when it’s one [switch supplier], so you can see how it gets more difficult if it’s being done over many different vendor platforms,” he says. “The chances of it actually being done correctly are small.”

The solution may be to implement a common layer of software across all vendors so it will become easier to get equipment from different vendors to interoperate.

“We’re basically prototyping a set of distributed algorithms for multipoint communications via virtual circuits and providing that software layer for telephone companies,” Turner said.

This will help project participants Bellcore and Southwestern Bell but may ultimately be more important for LANs because multivendor nets are going to be essential if local ATM is going to thrive, Turner says.

“We have several thousand workstations and PCs in our campus network, and every one of those will be potentially connected to the ATM network.”

Glimpse into future

Presuming these thorny ATM problems can be worked out, the next most interesting questions become where and how ATM will emerge.

Turner has a contrarian view.

While wiring hub vendors contend that ATM will emerge as a premise backbone technology in late 1993, in wide-area networks in 1994 and finally be extended down to the desktop beginning in 1995, Turner doesn’t see it happening so sequentially.

“I see all the steps sort of happening together,” he says. “What motivates me most about ATM is the desktop connections. To me, that’s the reason for putting in ATM. That’s where you can do things with ATM that you can’t do with Ethernet.

“If you just put ATM in the backbone, you’re not really doing anything you can’t already do,” he points out.

In Turner’s view of the future, the workstation becomes the central communications device. “On a workstation, you’ll have computing and communications completely integrated, so you’ll be able to do voice and videoconferencing across the country to multiple sites at the same time,” Turner says. “That’s where the real interesting things can take place and where it will appeal to a broader set of end users.”

He sees most end user connections being 155M bit/sec, with 622M bit/sec trunks being used between major switches and to support large servers and supercomputers. “We have several thousand workstations and PCs in our campus network, and every one of those will be potentially connected to the ATM network,” Turner says.

“We see the need for maybe half a dozen large switches — certainly 64 ports and probably 256 ports — which will be directly connected to one another and surrounded by a large number of small concentrators, which will fan out to 16 or 32 users.

“The small switches will use twisted pair and some will do local switching and some won’t.”

Role for routers

He also believes ATM will coexist with existing connectionless, datagram-based LAN resources for some time. “You’ll see a mixing and matching of the datagram and virtual circuit environments,” Turner says. “The datagram environment won’t go away for a while, but I think it’s increasingly going to be implemented over an ATM subnet.”

He also envisions routers being retained but serving different roles. “I see routers evolving as service nodes on an ATM backbone,” he says.

For example, if Nodes A and B wanted to exchange a short message, they might do it by sending an IP datagram through a router sitting on the ATM net, Turner explained. This obviates the need for the ATM net to set up an end-to-end virtual circuit, which takes longer and is more resource-intensive.

“If you’re doing a file transfer, something long, it makes more sense to go ahead and set up a virtual circuit between A and B,” Turner says. “But if all you’re doing is sending a short E-mail message, it makes more sense to use a datagram.”

In addition to conserving resources, this approach makes sense during the transition to ATM because existing software is designed for the datagram environment.

The future of ATM becomes more cloudy as it migrates out to the wide area, which is controlled by the carriers.

Turner expects the carriers to use equipment designed for the LAN market to provide ATM services beginning as soon as next year, but doesn’t see a proliferation of those services in the public network until 1995. ◆

MacAskill is a staff writer and Dix is executive editor at Network World.

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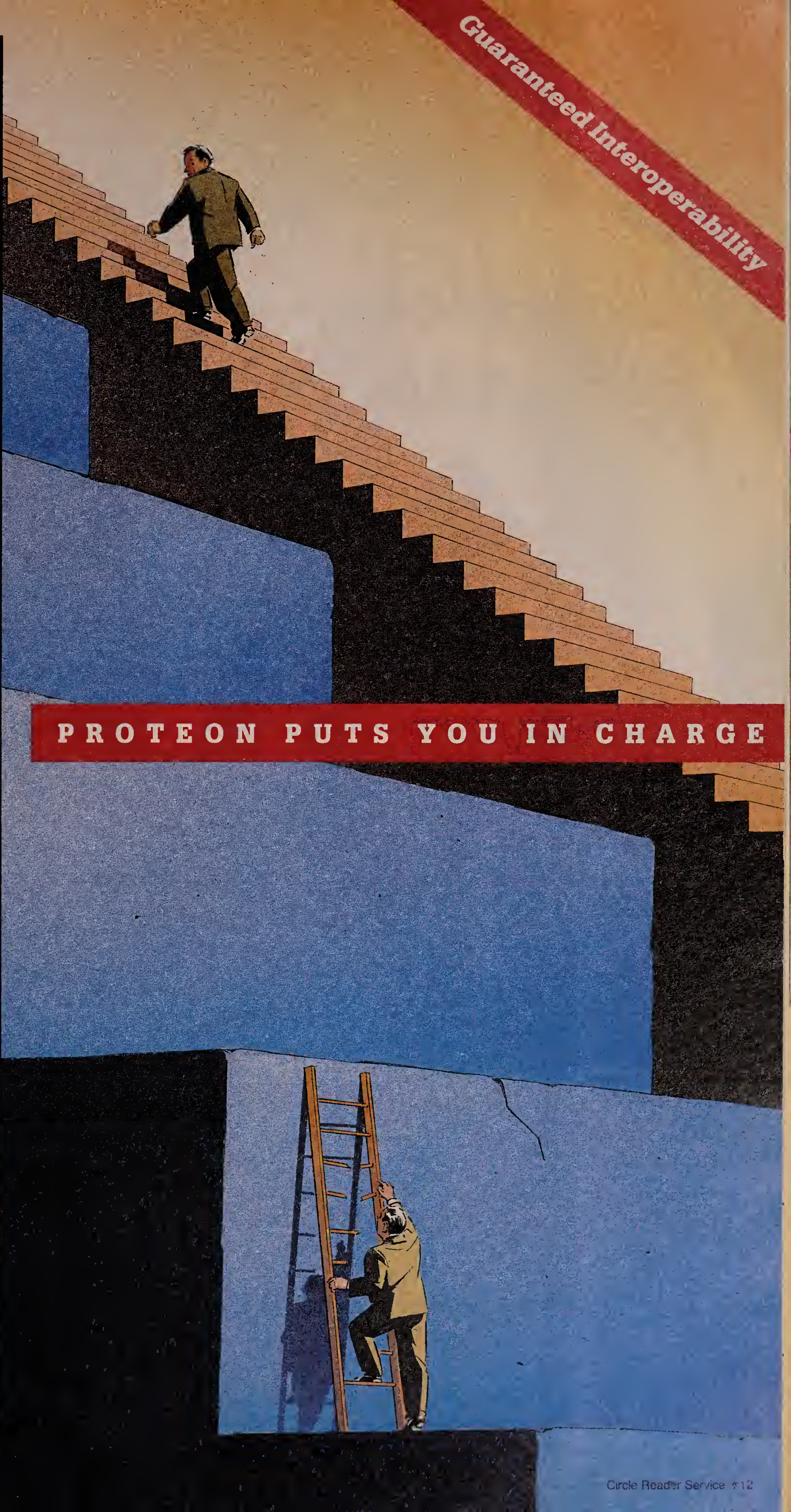

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DREW MAJOR

Coding the future of LANs

Ask Drew Major about the future of networking and you'll get most of your answers couched in the royal "we." That's not because the 36-year-old software engineer is speaking for himself and God, but because the single-minded Major doesn't seem to distinguish between himself, his employer, Novell, Inc., or his creation, NetWare.

So when the "father of NetWare" talks about the future of networks in general, it comes as no suprise that he's talking about the future of NetWare.

According to Major, that future will look more seamless and more powerful thanks to distributed services and filing systems. It will also look tougher for Novell as Microsoft Corp. makes another serious jab at networking with its Windows NT.

A beautiful relationship

Major came to Novell 11 years ago under the aegis of SuperSet, a handful of computer science graduate students looking for consulting jobs.

"We didn't even come up with the idea of networking," Major is quick to point out. "We had no networking experience when we came to Novell. We had OS experience, so we actually came in to do OS stuff for them and rapidly figured out what they were doing."

What they were doing turned out to be NetWare, and SuperSet never left.

Ask him about his passion, NetWare, and he grows animated, almost boyish.

Major has been credited with writing much of the core code for NetWare and for making it fast and efficient, his exclusive mission for more than a decade.

"My brain can only hold so much. I don't know how to use electronic mail or get my messages out of my phone," he admits. "Maybe I should be more of a generalist."

Questions about networking and the computer industry in general draw uninterested answers that seem to trail off with the phrase "and stuff." But ask him about his passion, ask him about NetWare, and he grows animated, almost boyish.

Still coding many of the core portions of NetWare from within SuperSet's suite of offices in Provo, Utah, jokingly referred to as "the Bat Cave," Major puts efficiency first. NetWare's success thus far, he says, has depended on it. "NetWare is a little unique in this industry in that each version becomes a little more efficient."

Although efficiency will distinguish Novell from the pack in the future by allowing them to support more users per server or to put more services on a single machine, the key to making networks more seamless is being able to spread the load, he says.

Past, present and future

"People don't really understand how to distribute things," Major says. "At Novell, we're partly there, in distributing things onto servers, but a server is still a single box. What happens when a whole bunch of boxes are viewed as one server?"

That's what users will find out with NetWare 4.0, Major says. And eventually, those servers will be able to act in concert, farming out tasks to each processor in the group as though it were only another processor in a huge server.

"Long term, that's important because you can just throw on servers where it makes sense and your world doesn't change and you don't have to worry about moving data around anymore," he says. "The next step is to do a fully distributed file system where you don't worry anymore where the data is."

While Microsoft is working on a fully distributed filing system for Cairo and Sun Microsystems, Inc.'s NFS distributed filing system has been around for a while, Major says Novell's probably won't look like either one. "We'll be doing something a little more robust [than NFS]," he says.

A distributed file system will also hold the key to supporting hand-held and mobile devices effectively, Major says. "You would have an environment where all the data you've been working on will be on your local machine and you can disconnect it without knowing that you are being disconnected," he says.

And NetWare's more distributed environment will make fault tolerance so important that Major predicts Novell's System Fault Tolerance (SFT) Level III, server-mirroring, will become as common as SFT Level II, disk-mirroring, is today. "Fault tolerance becomes more and more important," he says. "You'll have to have hints on the system that says this data is more critical so that data would typically migrate to SFT III servers."

Major doesn't seem to feel the pressure. "We like competition," he says.

Look into my crystal ball

In the next 20 years, Major sees networks being so integrated and so flexible that users' choices will be almost unlimited. "It will be just as easy to talk to someone and see them as I talk to you today," Major says. "You'll just choose what the appropriate media is. Do I need to talk to them? Do I need to see them? Do I need to transfer something? And when it's not live interactive, you'll be going to mailboxes and store-and-forward-type things."

Most of the pieces already exist today; it will just take some time to make them all work together, he says.

But NetWare certainly won't be alone in its ambition to make the network more distributed, Major says. He admits that Windows NT will present a substantial challenge to NetWare.

"If you were Bill Gates, what do you think would bother you the most?" Major asks.

No, not the "Outland" comic strip ridiculing Gates' dating habits, but NetWare. And that's going to make for some stiff competition from a big company.

But Major doesn't seem to feel the pressure so much as relish it. "We like competition," he says. "It makes you work harder." Then again, maybe the fact is that Major isn't really worried because he thinks Microsoft doesn't get it.

"The type of things we do are different from what Microsoft does; we are trying to make all these other [platforms] work together well," he says. "Microsoft is only trying to make their own products work well.

"For example, they have a new file system called NTS; it's for [Windows] NT. It supports DOS naming and their new [Windows for] Pen naming, but it doesn't support Macintoshes. This was the perfect opportunity for them to put name spaces in, but they didn't because they don't really want to support Apple and they don't really want to support NFS. They just want to support DOS, for backwards compatibility, and their new file system. They even cut out OS/2."

That's going to leave Microsoft out in the cold when it comes to multiplatform networks, Major seems to think.

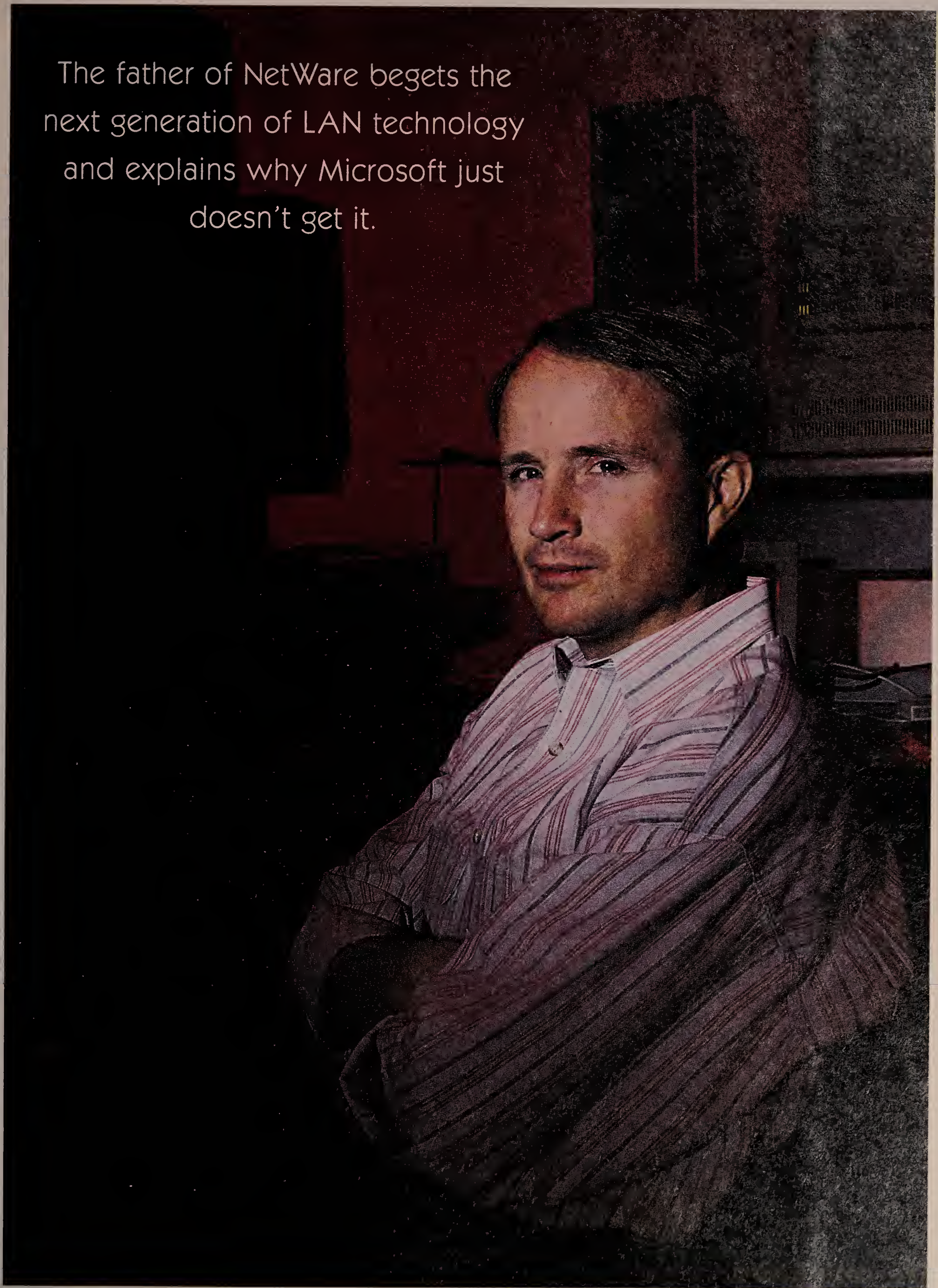
And where would Major be without Novell and NetWare? He waffles tossing out a few half-formed words, then dismisses the question with a guffaw. Seems he can't even imagine it.

In the near future, on the other hand, Major and the other members of SuperSet may shed their consulting status and become full-time Novell employees. "They finally came up with a good title for us," Major says, "system architects." ♦

Wylie is a San Francisco-based free-lance writer who specializes in networking and communications.

By Margie Wylie

The father of NetWare begets the next generation of LAN technology and explains why Microsoft just doesn't get it.



PHOTOGRAPHY TOM SMART

In 1543, Copernicus Defines the Heliocentric Universe

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International Data Corporation, Network World, and ComNet '93 have joined forces and developed the *Network World 500*, a research study focusing on the strategic issues facing large enterprise network managers in the '90s. This study, which interviewed 500 networking executives from some of the largest U.S. companies, is designed to provide a resource to vendors and users of evolving enterprise network solutions.

The results of this important survey-based research will be presented by Kim Myhre, Senior Vice President of IDC, at a special celebrity presentation entitled "Managing Enterprise Network Investments in the '90s", to be held on Tuesday, February 2, 1993 from 4:00 to 4:45 p.m. during ComNet '93. This session will be open to all attendees of ComNet '93, the industry's largest communications conference and exposition held at the Washington Convention Center.

Take advantage of a universe of information on emerging networking strategy. For more information of the *Network World 500*, please contact Elizabeth Freedman at IDC at (508) 935-4764. Or for more information on attending ComNet '93, please contact Janet Morita at World Expo Corporation at (508) 820-8611.

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FRANK GRATZER

The messiah of advanced services

By Daniel Briere

Not too many people can see their lives pass before them every day. But Frank Gratzer can.

Pinned to the walls of his offices in a corner of New Jersey suburbia is just about every article on frame relay and Switched Multimegabit Data Service (SMDS) ever written. And as executive director of broadband services at Bell Communications Research in Red Bank, N.J., data is Gratzer's life these days.

"It's our data hall of fame," he brags, pointing to the display like a proud father. "And it's growing every day."

Under Gratzer's command is development of future data services within the regional Bell holding company territories. From 56K bit/sec to 45M bit/sec, it's all life in the fast lane these days.

Enter the data man

Despite his California roots, it seems Gratzer has spent all his life in New York and New Jersey. After receiving a bachelor's in engineering at Manhattan College in New York and a Ph.D. in electrical engineering at Princeton University, he put in nearly 13 years at AT&T Bell Laboratories and AT&T.

When it came time to spin off the RBHCs, Gratzer grabbed the opportunity to move to their new research and development arm, Bellcore.

"I was almost first in line; I volunteered," he says.

Four years ago, Gratzer was charged with mapping the development and rollout of SMDS services at Bellcore. Early last year, he was given oversight of frame relay as well, rounding out his responsibility for the RBHCs' near-term data offerings.

At one time, SMDS was higher than frame relay on the RBHCs' wish lists, but both technologies are appearing in the RBHC networks at about the same time.

"There has been a lot of controversy around frame relay vs. SMDS — which one to do, or both," Gratzer says. "Obviously, a lot of users implemented frame relay first since it has been on the market longer. Frame relay has a leg up. It's accepted in the industry.

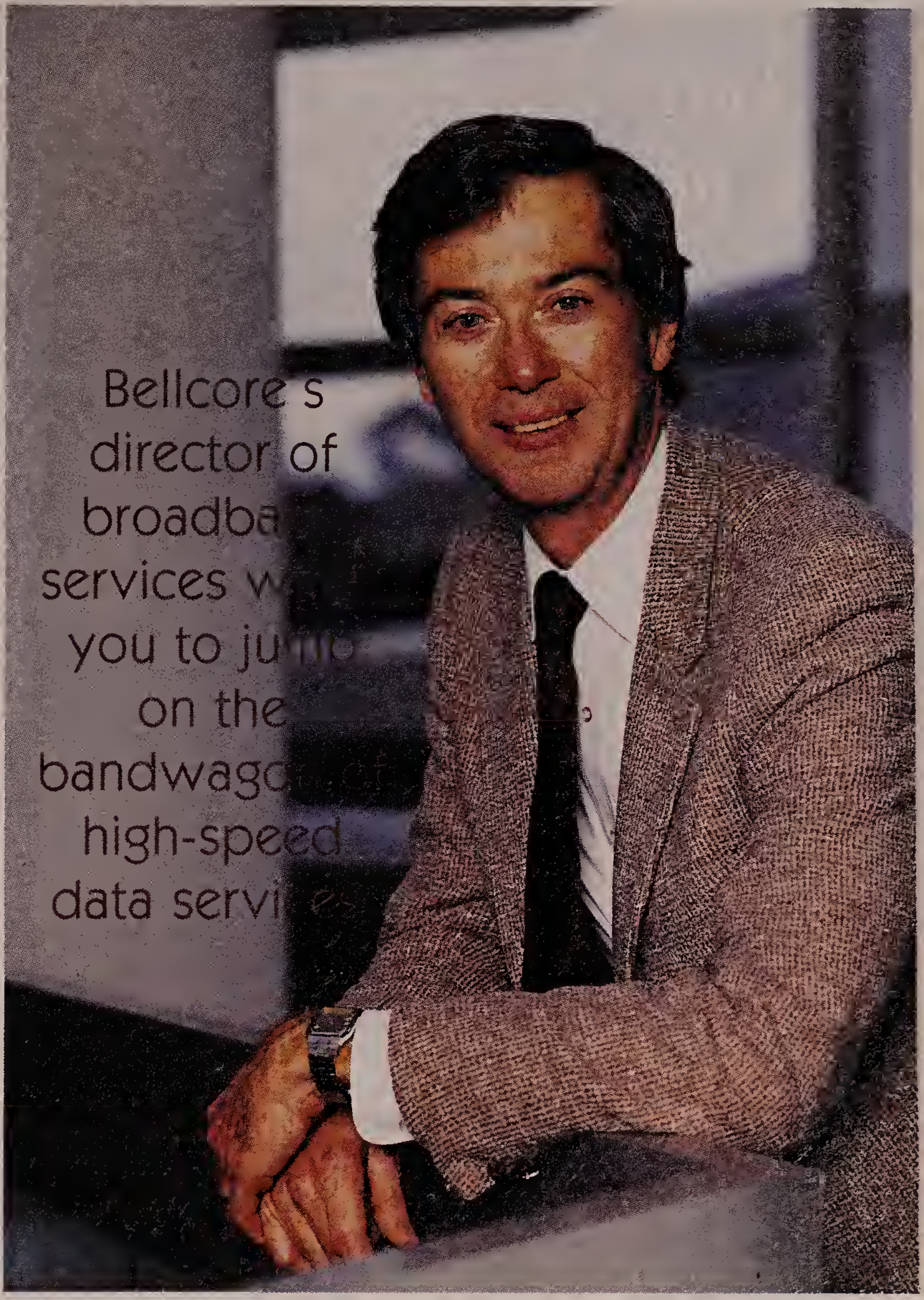
"But SMDS is a service that is hitting its stride. The strength of SMDS is the interenterprise aspect of the service," says Gratzer, adding that anyone can plug into the service and become a member of the SMDS data community.

Despite the current hoopla surrounding both frame relay and SMDS, Gratzer knows it will take time for the high-speed data offerings to meet with widespread user acceptance.

"Companies will put their toes in the water and funnel some data traffic over the services to try them out," explains Gratzer, gesturing as if magically moving traffic across his desk.

"If it is successful, the end users will gradually send more data over to that service," he says. "As they use the services more, they create more applications. It snowballs from there. As more applications are developed, more data will flow.

"All this requires a little bit of patience," Gratzer continues, sounding like someone who has been around the track a few times. "The carriers can't take five years to get a new service off the ground, or that will be the end of the service. But at the same time, you can't rush it. It will usually take a couple of years to really get a new service moving."



PHOTOGRAPHY DANILLE SWICK

MCI Communications Corp.'s announcement of SMDS service at INTEROP 92 Fall in San Francisco was a major psychological boost and, for Gratzer, a validation of sorts.

"Up to that point, only the RBOCs had truly committed to SMDS in the U.S. Now it goes from being an intra-LATA service to a national service, which is what everyone wants. And since many carriers in Europe are trialing the service, we will have global service soon," he says.

And in this corner, frame relay

Frame relay is gaining acceptance, too. With frame relay transmission capabilities moving up the market to speeds as high as 45M bit/sec and end users talking about frame relay access to SMDS networks, the boundaries between the two services are blurring. In some cases, the services take on a very complementary yet competitive stance.

Right now, frame relay is available up to 1.5M bit/sec and SMDS starts at 1.2M bit/sec, offering customers a choice of high-speed data services at that range of throughput.

"The killer application for both frame relay and SMDS is LAN-to-LAN interconnection," Gratzer says. "The availability of LANs is driving the demand for high-speed networking.

"There are instances when each

(continued on page S32)

(continued from page S31)

should be used. Over time, we would like to have frame relay customers be able to interconnect with SMDS customers, and vice versa," Gratzer said. "But it may be a while before we have true interoperability between the services."

Users should look for nationwide SMDS by the middle of 1993, according to Gratzer. "Most of the RBOCs and some of the [interexchange carriers] will have deployed the technology by that time," Gratzer says, noting that frame relay will be farther along, thanks to its earlier start.

By the end of 1993, SMDS should be in about 50 cities and frame relay in about 60 cities, he says.

Looking ahead, Gratzer predicts fast growth for both services. "Five years from now, there will be a number of cities — several hundred or so — where SMDS is available and somewhat more than that for frame relay," Gratzer says.

"If you look back to what the carriers projected back in the early part of 1992 in terms of deployment, they have met those numbers and, in some cases, exceeded them," Gratzer says.

The message for end users is that these are two technologies that are here to stay.

"One of the real advantages of frame relay and SMDS over other alternatives is that they are here," Gratzer says. "If the carriers can price them right, they should do well. Implementing one or the other really comes down to applications and the reachability — that is, connectivity — of the service."

For many end users, the challenge is understanding how these new technologies all fit together.

"One of the most misunderstood relationships is not the one between frame relay and SMDS — although we need to work on that one — but among frame relay, SMDS and [Asynchronous Transfer Mode]," Gratzer explains.

Indeed, many users talk of waiting for ATM instead of implementing frame relay or SMDS. "Frame relay and SMDS are not interim services; they are here for the long haul, and ATM will be a vehicle for carrying them in the future," he says.

According to Gratzer, ATM provides the carriers with a versatile transport mechanism.

"The carriers can't take five years to get a new service off the ground, or that will be the end of the service. But at the same time, you can't rush it."

"From the carriers' point of view, there will be both new and existing services carried over the ATM network," he says. End users can use their existing equipment and services over the ATM backbone. Those staying with existing services will not even know they are on the ATM backbone, he says.

Gratzer projects that ATM will start working its way into the LAN environment quickly, especially with the focus on multimedia applications. For the wide area, ATM is down the road, with trials expected in 1993 and 1994.

"As higher speed applications, such as multimedia, come in, some will be carried initially by frame relay and SMDS, and some will migrate to ATM wide-area services.

"Applications and services evolve over time," Gratzer cautions. "There is no silver bullet here." Gratzer's biggest concern is that end users will keep waiting for the next great technology instead of installing what's available today, such as frame relay and SMDS.

"These services work. They are here now. There is equipment for them. And future platforms will support them," he says. "What more can you ask for?"

For a man living in a world where the pace is already pretty fast, Gratzer says, "I'd like it faster."◆

Briere is president of TeleChoice, Inc., a Montclair, N.J., consultancy.

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DAVE MAHLER and LARRY GARLICK

Managing to succeed

The founders of Remedy want you to look at net management in a whole new way.

By Bob Brown

PHOTOGRAPHY DAVID WEINTRAUB

The way Remedy Corp. cofounders Larry Garlick and Dave Mahler see it, if they can get along, so can just about anyone in the network industry.

Garlick, Remedy's chairman and chief executive officer, is an engineer at heart who gets a kick out of the bells and whistles on new products and is at-home on a tennis court when not working. Mahler, Remedy's vice-president of marketing, is also an engineer, but he is a true marketeer who sometimes spends his free time scaling rocks at Yosemite National Park.

Not long ago, Garlick and Mahler were rivals backing the competing network management platforms offered by Sun Microsystems, Inc. and Hewlett-Packard Co., respectively.

Despite these differences, Garlick and Mahler shared a vision that drove the formation of Remedy, which was launched in November 1990 as one of the first independent developers of network management applications designed to run on multiple management platforms.

"We believe our differences are among our greatest strengths," Mahler says. "They give us an unfair advantage as far as our understanding of the entire net management picture is concerned."

Remedy to the rescue

Remedy introduced its first product, an automated trouble-ticketing tracking application dubbed the Action Request System, in September 1991. The software is designed to run on a standalone workstation or with existing management platforms, such as SunConnect's SunNet Manager and HP's OpenView net management platforms.

Among the key capabilities of the product is the automation of tasks, such as the reporting of a network problem, Mahler says.

Remedy's second product, Health Profiler, made its debut this past October. It is an object-oriented management application that presents net administrators with "visual dashboards" highlighting the status of net elements.

Remedy has created quite a stir in the industry. At both product introductions, Garlick and Mahler were flanked by officials from a host of big-name network firms — including Cabletron Systems, Inc., Digital Equipment Corp. and Novell, Inc. — that have voiced support for Remedy's products and, more important, its philosophy.

Remedy proposes that network equipment vendors can slash development costs and that management applications will come to market faster if the job of building management platforms and foundation management applications is left to specialists in those areas.

Much to Mahler's and Garlick's delight, equipment vendors have embraced the idea that they are better off focusing on applications specifically designed to control their devices.

"The vendors had their plates full, and third-party application developers represent relief," Mahler says. "It shows you how the industry has matured."

The philosophy is on a roll, adds Mahler, who sometimes rolls into work on skates. Among other signs, Remedy reported its first profitable month just five months after it started shipping products, net management platform sales are booming, and new independent management application firms keep popping up.

According to Mahler, things look bright, thanks in large measure to the growing momentum behind the Open Software Foundation, Inc.'s Distributed Management Environment, a common net management platform on top of which application vendors can build.

Humble beginnings

While many have embraced Remedy's net management philosophy, Garlick admits there wasn't such a grand plan in place when the company was formed. Rather, the concept has evolved.

Garlick left his job as vice-president of distributed systems at Sun in July

(continued on page S34)

(continued from page S33)

1990, with the idea of working on a start-up in the network or systems management area. The Stanford University alumnus consulted for a short time with a venture capital firm to see what kinds of companies were being formed and to better understand what vendors and users wanted.

Late that summer, Garlick was united with Mahler at INTEROP 90 Fall after learning that some of HP's management experts were looking to join a start-up.

"It was clear to us both that applications were the missing piece of the management puzzle and there was a big opportunity for us to compete or work together," he says. "We decided to work together."

The company began in an unheated one-bedroom cottage behind Garlick's house, where one engineer actually had to use the heat from a workstation to keep his hands warm.

But Remedy was well financed from the start, and the firm moved to an office in Sunnyvale, Calif., and then to Mountain View, Calif., where the 24-person company is now located.

Despite the intrinsic appeal of the independent management applications concept, Garlick doesn't believe the market will be particularly large dollarwise.

Growth factors

Mahler acknowledges that there will be a great number of management applications launched in the next couple of years.

"There will be a lot more attention paid to the application side and a lot less to the protocol and platform side, which will be fairly standardized," he says. Likewise, Garlick does not think the specific product niches carved out by Remedy to date — trouble-ticket tracking and network health profiling — have huge market potential.

"The big market is not for problem resolution, but rather the automated tracking of things," he explains. "Health profiling isn't huge, but masking SNMP-Management Information Base data is."

The key to success will be "to add to the productivity of people," Garlick adds.

Network departments can't afford to have staffers staring at monitors all day.

"Solving the network management problem really has nothing specifically to do with the network," Garlick says. "It has more to do with the support process and enhancement of teamwork."

That includes enabling network managers to make better use of top engineers by making better use of less experienced staffers.

The Remedy way

Fostering teamwork is something Remedy knows all about. The company's former Sun and HP employees, as well as those from Oracle Corp. and Sybase, Inc., have learned to blend their different perspectives for the good of Remedy.

"We know as much about the platforms as the platform vendors themselves," Mahler said. "Customers look at us as having a credible combination of people and treat us almost as consultants. We've influenced more than a couple of [vendors] to accelerate the pace at which they've moved away from proprietary management systems."

The bottom line for Remedy is providing software that works with platforms having the most "seats," or users. "That's an issue we all agree on," Mahler adds.

Remedy is not alone in the third-party management applications market. Others, such as ISICAD, Inc., Metrix Network Systems, Inc. and Networx, Inc., have emerged and are beginning to develop a following.

Whereas Remedy has been most prominent to date in integrating management applications vertically with various management platforms, the company's biggest contribution going forward could be its work to integrate multiple vendors' applications horizontally.

Remedy already has teamed with ISICAD and Metrix to enable users of applications from those vendors to kick off Remedy's applications, and vice versa.

"In the next two years, there will be a much higher degree of integration between applications," Mahler says.

"When people today think about integrating applications, they think about *A Nightmare on Elm Street*," Mahler says. "They figure they need to do coding or get the vendors to do some type of engineering to integrate applications. We need for it to be much easier than that."

Interoperability of applications is crucial to the continued success of management platforms. In fact, Remedy is considering teaming with other vendors to develop some kind of "interoperable applications logo" that could be stamped onto tools that work together.

If so, Remedy's cure will once again be based on bringing different parties together. ◆

Brown is a senior editor at Network World.

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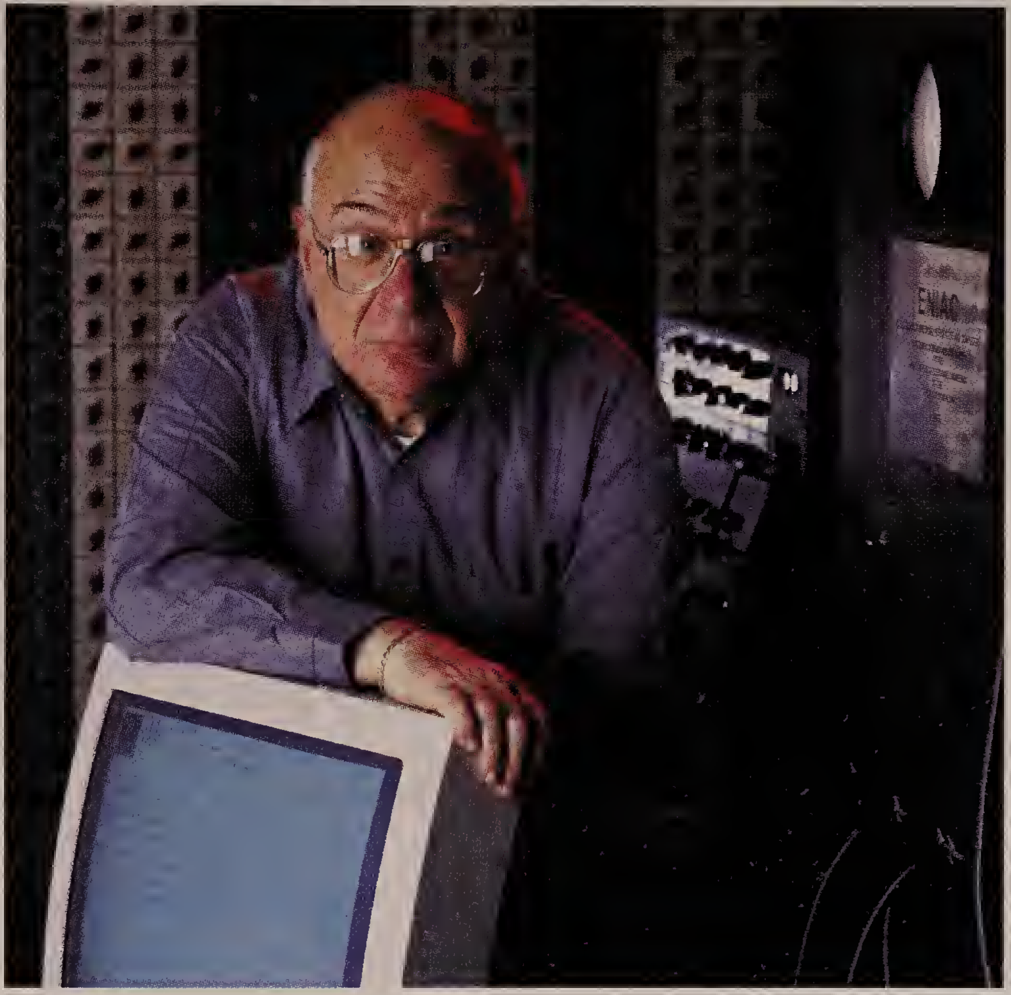
DAVID FARBER

A distributed view of the world

U. Penn visionary sees an intrinsic link between ultra high-speed networks and the emergence of true distributed computing.

By Michael Cooney



PHOTOGRAPHY EUGENE MOPSIK

Few networking visionaries get to work hands-on with their ideas everyday, but David Farber has been enjoying that luxury for almost 30 years.

A pioneer of distributed computing, Farber is a professor of Computer and Information Science as well as Electrical Engineering at the University of Pennsylvania (Penn) in Philadelphia. He heads up the university's Center for Communications & Information Science & Policy, which operates an ultra-high-speed networking and distributed computer architecture laboratory.

As if that weren't enough, Farber has served as secretary of the SHARE user group, as well as an executive board member, a vice-chairman of the Institute of Electrical and Electronics Engineers, Inc., chairman of the Computer Science Network Executive Committee and founding chairman of the Network Program Advisory Group for the National Science Foundation (NSF), among other things.

Farber's interest in distributed computing grew out of research in local-area networking conducted at both the University of Delaware and the NSF in the early 1970s. There, he experimented with distributed applications running over token ring-type LANs operating at 2.4M bit/sec.

According to Farber, industry interest in distributed computing has waxed and waned in the years since then, but there is a growing momentum today.

"This is an exciting time in distributed computing and high-speed networking because we don't know what the next step will be," he says. "There are a lot of ideas floating around."

Many of those notions — such as the global computer or virtual factory — are coming from the work Farber is doing with Penn. One of the most far-reaching of those ideas is the establishment of a nationwide and, ultimately, worldwide distributed gigabit net. Many changes will have to take place before that vision can be achieved, Farber says.

And he speaks from experience with high-speed nets.

Farber was instrumental in setting up the first high-speed net, NFSNET, which is a national research and educational network built on 45M bit/sec T-3 facilities. However, it will support gigabit speeds in the future. "As you get up into the gigabit range in networking, every notion you had about communications breaks," Farber says.

For example, even the most powerful workstations cannot handle a gigabit datastream because of memory and operating system restrictions. "Operating systems are too bulky, too ponderous to do gigabit networking," he says. "Users will need as little between them, the computer's memory and the processor as possible."

Even if users could get that rush of information into the computer, they'd have to worry about how it would flow through an Open Systems Interconnection or Transmission Control Protocol/Internet Protocol stack.

According to Farber, existing communications software was built to run on very noisy communications switching systems at relatively low speeds. "When we jump to gigabit speeds, it will be a revolutionary shift," he says.

This revolutionary shift will also require changes in the way data is transmitted across the country, Farber notes.

Mechanisms will need to be placed in the public network switching fabric in order to help users locate other users and resources. Having located a resource once, the switch will need to remember where it is for future reference. That will require telephone companies to build directories into switches in order to keep track of resources.

Going into ORBIT

Farber says the lab has done some simulations of gigabit networking using IBM's Optical Ring using Buffer Insertion Technology, which operates at 1.2G bit/sec and runs on fiber-optic rings. He adds that the computers on the rings share one another's memory, giving end users the impression that they are working from a single machine.

Farber's charter is to explore the technologies needed to make gigabit nets a reality.

"Our charter is to be an idea generator for applications and technology," he says. "So when somebody wants to build a national gigabit highway, they can now start by looking at what's been done in the lab."

Pushing the speedometer of network technology isn't the only reason to experiment with gigabit networks. Rath-

(continued on page S37)

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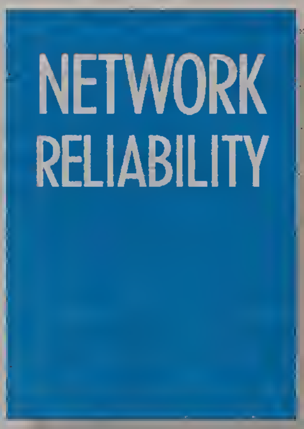

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(continued from page S35)

er, it's the fact that availability of those networks will drive truly distributed computing, according to Farber.

"We're trying to build a global computer that replaces all of the communications [systems] we know today with basically a single large distributed system," Farber says.

But even if such a global computer were possible through high-speed nets, the market for such distributed technology is not all that clear yet. Farber says he is trying to understand what the applications for gigabit networks might be. "I'd like to find a commercial application that the industry could use," he says. "They could pay the development bill, and we could work on the model."

One such real-world application Farber envisions is the establishment of virtual factories. A virtual factory would bring together the talents and resources of dispersed employees or business partners on a project-by-project basis.

Take, for example, an aircraft manufacturer. Far-flung divisions or subcontractors building such diverse components as wings or control systems could establish a simulated wind tunnel that lets them see how their systems are working together.

Farber says vendors could further the cause of distributed computing by building better networking products.

"Vendors tend to produce products for what they [think] the outside world wants, and sometimes it's a product nobody wants," Farber adds.

Farber notes that a better approach is to follow the advice of a Hewlett-Packard Co. executive who once told him that HP's most successful products were those that the company needed and used itself.

"Vendors should be using their own technology," Farber says. "If a vendor is building LAN products for the office world, they better be using the product in their own offices. If the vendor isn't using its own product, that should tell the user something.

"I think you'll find a strong correlation between those who do use their own products and those who have been successful," he adds.

Vendors could also help themselves by forming partnerships with universities, according to Farber. The colleges can produce ideas that the vendors can build into products.

"Industry isn't really good at generating ideas anymore," he notes. "The right thing to do is treat universities as idea generators. Industry and universities could work well together in that role."

But that relationship sometimes can be strained.

"Vendors in the computer and networking industry have had the sad idea that, somehow, universities should produce products," Farber says. "What they should expect out of universities are ideas, which is what they'd expect out of their research divisions."

For example, IBM is heavily involved in research with colleges, but it expects to get products out of the work, Farber notes.

"In the old days, IBM wouldn't ask a research lab for products; in fact, they used to yell at them for trying to make products. They wanted ideas, directions and prototypes," Farber says. "They should get back to that level."

Even if the high-speed network technologies envisioned in labs similar to Farber's reach the product stage, they'll still have to overcome mundane user concerns such as cost. But Farber does not think cost will be an issue for long when users find out what can be done with distributed computing.

"If there are problems in corporations that won't go away and users are killing themselves to get the work done, cost will not be an issue," he says. "The question will be, can [high-speed distributed computing] be done? The money is there if the help can be found."

The help will come, at least in part, from systems integrators, according to Farber.

"What we have now is a lot of small companies, each of which do parts of technology nicely, but we need a system that can integrate all these pieces," he says. "In the next 10 years, the industry will see a reemergence of systems integrators to bring all these pieces together and make them work."

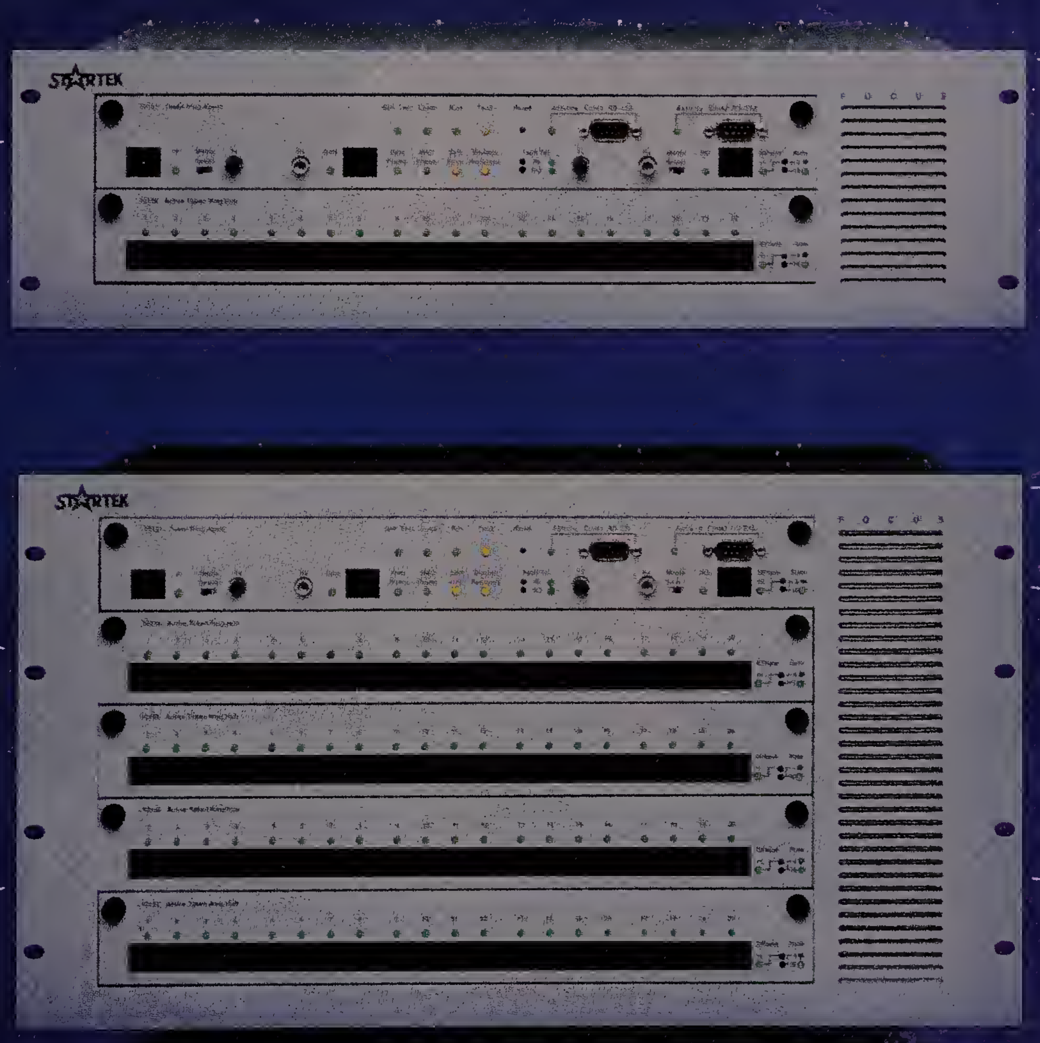
But then again, nothing is certain in the distributed computing world of the future. Prediction is a dangerous business: Only a decade or so ago, some people said there was no market for personal computers in the workplace.

"Many vendors want firm marketing forecasts before they'll enter a market," Farber says. "But sometimes you'll find people who are willing to take some gamble and they win.

"I think the future will be an excellent time to take some gambles," he adds. ◆

Cooney is a senior editor at Network World.

Focus On Token Ring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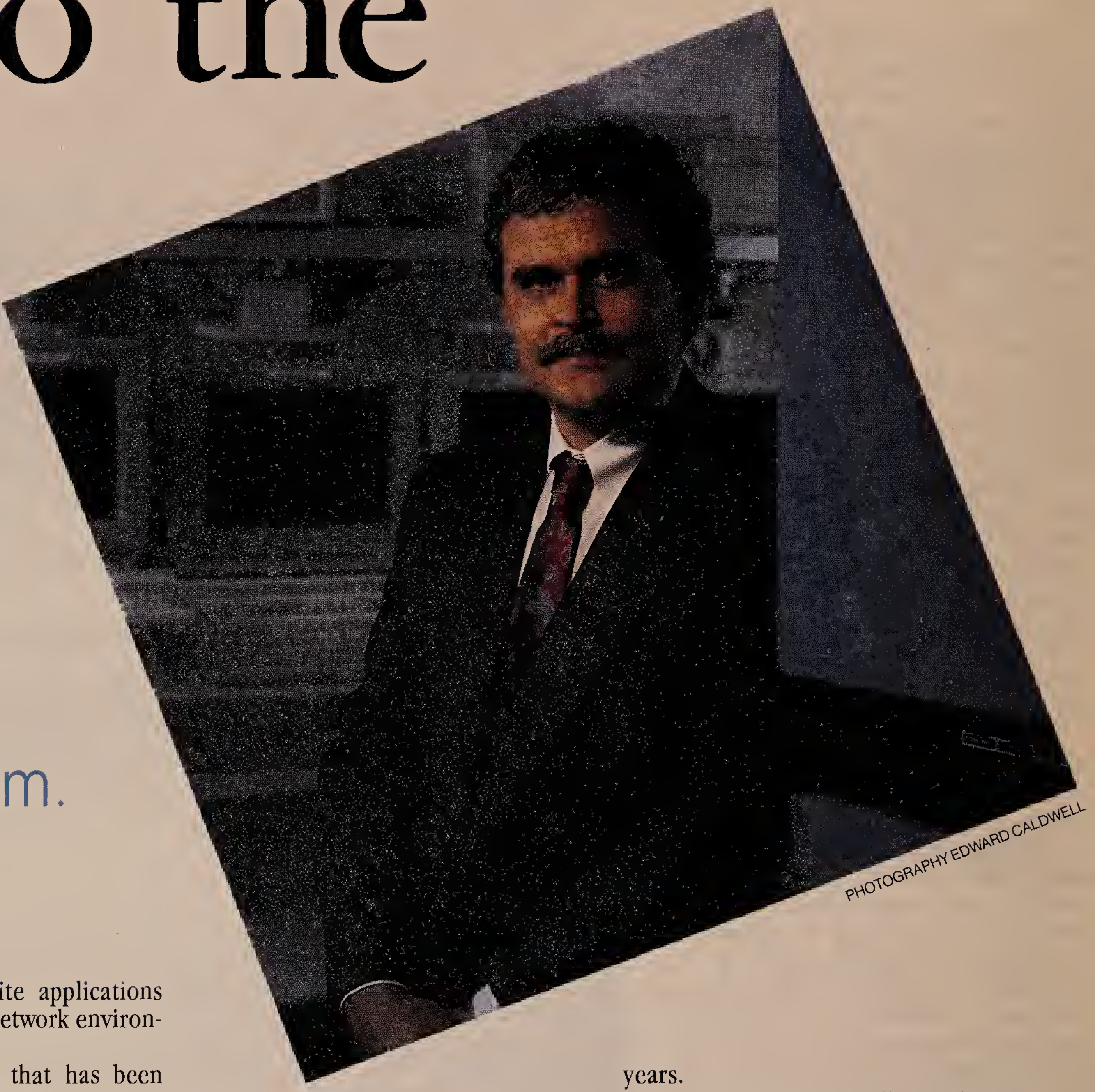
Power to the people

This network coach is pushing for a new generation of apps and wider access for the PG&E team.


PHOTOGRAPHY EDWARD CALDWELL

Art Beckman is already getting into his office when other people's automatic coffee makers are just starting to perk.

The usually busy San Francisco roads are clear and the foghorns sound in the distance as Beckman makes his way into Pacific Gas & Electric Co. (PG&E). He reaches his desk at 5:30 a.m., the best time of day to get some serious thinking done and prepare for the hectic hours ahead. He'll bounce from meeting to meeting starting at 7 a.m., work through lunch and head for home about 7 p.m.

A busy day, indeed. But that's what it takes when you head up a team of more than 120 people that have already accomplished what most other companies are just starting to think about.

Beckman and his colleagues have implemented a local-area internetwork that has become a key asset for PG&E and are developing network-based applications that will open up the world for end users of every ilk at the giant utility company.

With that challenge in mind, Beckman helped form the Network Application Consortium (NAC), a user group intent on establishing a set of standards that will enable users or third-party developers to easily write applications that run in any given network environment.

That's a challenge that has been building up over the years. Since he got one of the first personal computers in PG&E 13 years ago, Beckman has seen PCs claim prime real estate on over 20,000 desks. Virtually all of them are now linked through an intricate network web that includes more than 450 servers running Banyan Systems, Inc.'s VINES network operating system.

Beckman and his team have put in place the underpinnings of an architecture that will support a wide array of powerful networked applications. Those applications will let any employee — or customer and supplier — with a PC and proper security clearance easily access information anywhere in the vast caverns of PG&E's data warehouse, even off a mainframe.

"We don't have a thing that says mainframes are going to totally disappear," Beckman says. "We believe they are another piece of the overall computing environment."

Mainframes will still be used to run applications requiring large amounts of processing power and data storage, such as billing. "But they should be another peer on the network and a big data warehouse," Beckman says.

The vision

Someday, Beckman says, a lineman climbing a pole to repair a faulty power cable will be able to whip out a wireless data terminal and, using new applications, access a historical repair file on a server at headquarters. As it shifts through this historical data and takes input from the lineman, the terminal could even suggest repair strategies.

"We're trying to put together an environment that enables a user to have seamless access to data and information throughout the company," says Beckman, who graduated from the University of California at Berkeley in 1977 with a computer science degree.

Beckman came to PG&E after a two-year stint as a teacher at San Francisco High School, a position he took right out of college.

He continued educating when he arrived at PG&E. He took on the task of helping PG&E employees learn how to use PCs, as well as taught night classes at San Francisco State University for six years.

"People with PCs really needed to get more direct end-user support," Beckman says. "So I started a group that was one of the first to be decentralized from the [data processing] group. We actually lived out in the client community and helped them with end user computing."

That group, Computer Client Services, had seven people. It has now grown to more than 120 individuals responsible for supporting end-user computing throughout the company.

"It's a huge team effort," Beckman says. "I couldn't do any of this without the people that work with me."

The rewards

That team effort pays off and it's gratifying for Beckman to see the results.

"I believe connecting people and enabling them to communicate is a powerful tool," he says. "I had one of the first PCs brought into PG&E, and it's amazing to go around this company now and see how people are using that technology."

For instance, Beckman proudly

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By Jim Brown

An object orientation

The outspoken disciple of object technology wants a sea of change in application development.

Phillipe Kahn talks a lot about object-based computing — maybe too much, according to detractors who say he overhypes the technology.

A mathematician by training and an experienced yachtsman and musician, Kahn launched Borland International, Inc. in 1983 to develop and market application software and programming languages. With $500 million in revenue and 2,100 employees, Borland now boasts a full suite of software products, including the Paradox, dBASE and InterBase databases, the Quattro Pro spreadsheet, the Sidekick personal organizer and ObjectVision, Borland C++ and Turbo Pascal programming tools.

Kahn says object technologies will have the same impact on software as the integrated circuit had on hardware 20 years ago. Objects help programmers reuse code and assemble programs modularly, making it easier to build applications.

In 1988, Borland committed to redeveloping its entire product line using object-oriented methods. Last year, Borland released its first object-based products: Turbo C++, Turbo Pascal and ObjectVision. This year, Borland launched an object version of Quattro Pro for Windows and is expected to release an object version of Paradox for Windows next year.

In an interview with *Network World* Senior Editor Wayne Eckerson, Kahn discussed, among other things, the role of objects on client/server and distributed computing, butting heads with Microsoft on standards, the problem with Lotus' Notes and why your kids should be programming now.

What is the biggest challenge facing your customers right now?

Keeping up with technology. We are riding the third wave of technology on the desktop, from character-based computing to graphical user interfaces and now to object-based computing. What users want is help mastering the new paradigm so they can get better returns on investment and increased productivity.

In the character-based world, a spreadsheet application might consist of 50,000 lines of code. In the GUI world, it would consist of 250,000 lines of code.

Today's object-based applications, such as Borland's Quattro Pro, consist of 1 million lines of code. Quattro Pro took us three years to develop.

By the turn of the century, applications will consist of about 10 million lines of code. That's a challenge.

So what is Borland doing to help?

We have taken leadership in object computing and client/server computing, and our goal is to share that knowledge and technology know-how with them and, as a consequence, have them and us prosper.

Obviously, we can't keep building software in the traditional manner. That's where object component architectures come in. Each time we develop an application, we don't want to start from scratch. The idea is to solve the problem of reusable code. Different applications can share many of the same components, such as reports, forms and data access. This makes it possible to minimize the number of lines of code we write.

I remember Bill Gates said if objects are so great, why hasn't Borland shipped earlier. That's not the point. The point is reusability. The first version is going to take more time if you use object-oriented development methods. It will take 25% more time for the first version. Then the rate at which you will be able to develop product revisions will be significantly faster than other companies. We think you'll see a new version of our products every nine months or so. That's where the benefits are.

I predict that within the next five years, most people will have an object component architecture at the heart of their product strategy.

Some industry observers say object computing has been overhyped. Do you agree?

A lot of people hype object computing. I completely agree. There are companies that have done nothing with objects [but call] their products object-based. It's a little irritating. But when you look at a product like Quattro Pro for Windows there is plenty of concrete evidence that object computing provides significant benefits.

What impact will objects have on network computing?

Objects have several implications. If you look at distributed computing, the problem is that the level of complexity of the applications is increasing, especially in the networking environment. Through reusable, modular code, objects will make it easier to develop client/server architectures. Objects and client/server go hand in hand.

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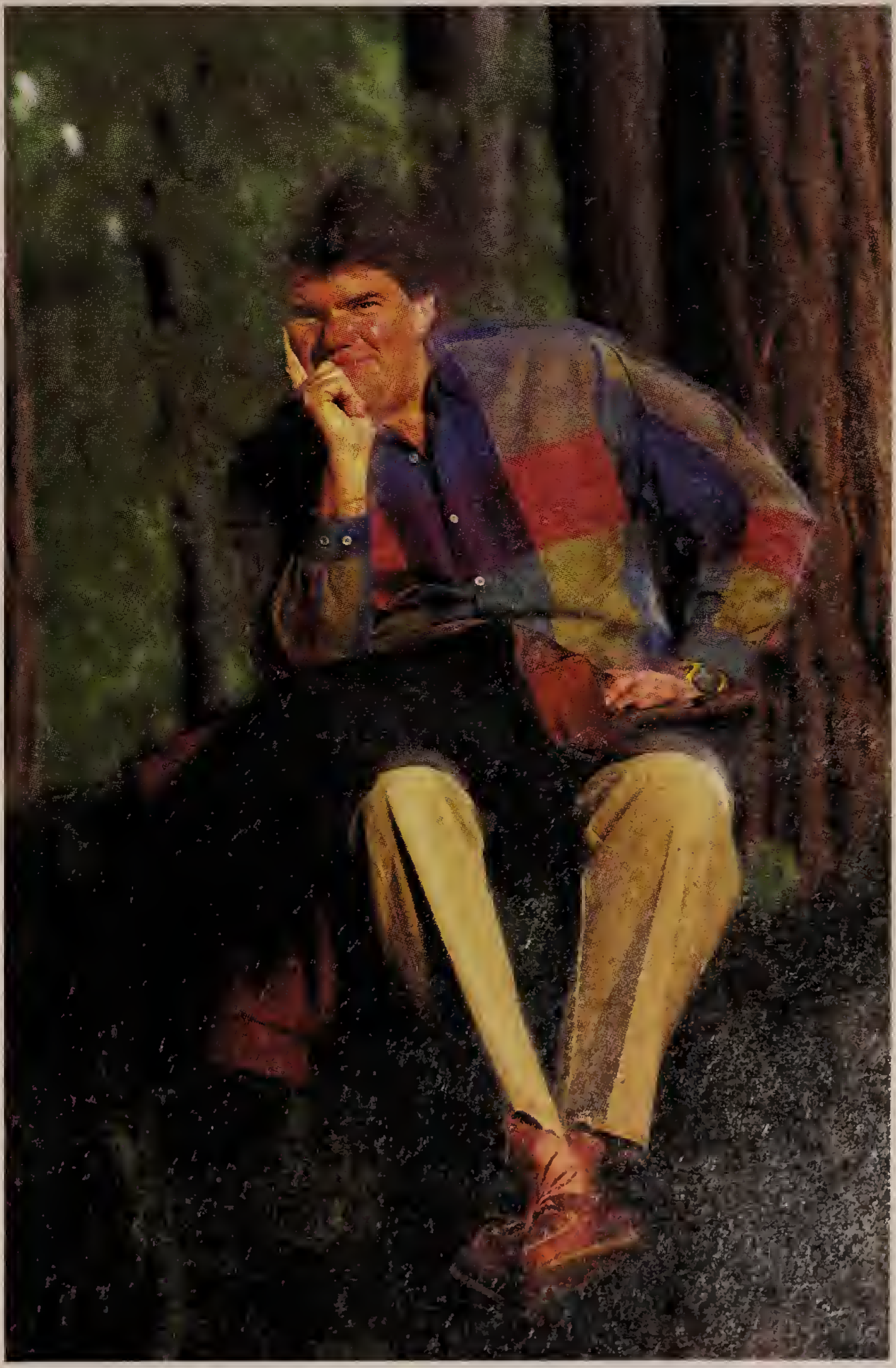

PHOTOGRAPHY ALAN LEVENSON

BY WAYNE ECKERSON

LUCIE FJELDSTAD

It's a multimedia world

This IBM VP dreams of a future with easy access to all sorts of information.

By Kyle Nitzsche

When you get IBM Vice-President Lucie Fjeldstad talking, it's hard to figure out whether she's a visionary, an economic patriot, the consummate saleswoman — or all three.

Fjeldstad, who heads up an IBM multimedia venture, is pushing hot new packet-switching technologies that she says could help unite many of today's disparate networks into a "single gigabit national mutimedia network." If her dream is realized, it will pave the way for what Fjeldstad terms "the coming interactive age in which anyone will be able to get any information they need at any time from any place."

> Fjeldstad cites Asynchronous Transfer Mode as a likely unifying transport.

In this coming golden age, videoconferencing will largely replace travel in corporate budgets. Colleagues will collaborate on projects while separated by thousands of miles. People will face off against one another on real-time networked video games or order up movies on demand. They will shop from their homes and read customized "magazines" assembled by personal sort algorithms operating in a universe of digital information.

Students and business people alike will increase their skills by "attending" distant classrooms via multimedia links. But most importantly, the U.S. will gain a key competitive edge through increased productivity.

Fjeldstad has been preaching this gospel since January of this year, when she was named an IBM vice-president and the general manager of multmedia application solutions. She was appointed the president of IBM's Multimedia and Education Division in 1990. Fjeldstad worked her way up from her start at the firm in 1968 as an associate systems analyst.

But this veteran Big Blue heavyweight knows that business and residential users alike have grown cynical upon hearing such glowing scenarios painted time and again over the last decade. She says that certain key elements have fallen into place during the past few years that could bring such high-bandwidth multimedia applications to the business world sometime in the next two years and to the home in the next three to five years.

One key element is the increasing percentage of homes that are hooked into the broadband cable network, which has the potential to provide the bandwidth needed to carry multimedia applications into the home. If broadband cable becomes the standard link for the "last mile" into the home, Fjeldstad says, the world will not have to wait for phone companies to install fiber to the home, a mammoth undertaking that would cost billions.

"Five years ago when people thought about how to realize this dream, they thought they would have to rewire America," Fjeldstad says. "The new and big news is that you don't have to change a wire to make this happen. All you have to do is add hardware and software to what is out there to bring it up to gigabit capabilities. This means the cost of getting into this has decreased substantially."

Another key to her vision is the evolution of today's multiple and diverse networks into a single, composite digital network. It will likely use packet-switched technology to provide high-bandwidth, interactive services. Fjeldstad cites Asynchronous Transfer Mode as a likely unifying transport.

This vision encompasses just about all of today's networks, from the long-haul and local carriers to broadband cable networks and business local-area networks — linked, of course, with fast new IBM switches and routers.

Fjeldstad admits the road to ubiquitous multimedia could be far from smooth. For example, while many businesses are now willing to ante up the investments needed to get multimedia applications off the ground, she says the "killer application" that could propel these emerging technolgies into the mainstream probably does not yet exist. However, she is confident it will arrive.

"I'm not kidding when I say it will probably be developed by a 12-year-old kid, someone who has grown up with a wide range of technologies and really understands them in their bones," she says. "What we are doing is laying the foundation for the new medium, knowing that once the medium is in place, it will be used.

"What happened when television was first introduced? They used it to put on vaudeville- and radio-style programs. That's the way most people are thinking about multimedia right now."

Even though the killer application that could provide the push needed to bring multimedia to the fore might not yet exist, Fjeldstad has seen intense interest by many firms that were skeptical until quite recently. "Just two years ago we had a hard time even talking to the business world about these kinds of applications," she says.

As an example, Fjeldstad cites a Chicago-based advertising firm that has its creative department in Los Angeles. Working on multimedia projects involving both offices is cumbersome and expensive because of the need for travel or the time delays of shipping packages.

"They are interested in the ability to create and edit advertisements collaboratively using networked multimedia. They expect this to save them so much money, they are ready to go into test mode right now and want to know why we are not yet there," Fjeldstad says.

So, according to Fjeldstad, the business case for nationally networked multimedia already exists. And she claims many studies show that productivity rates will be dramatically increased by such applications.

For these plans to materialize in a cost-effective fashion, several things must occur — not all of which will be simple. The single biggest threat to her grand scheme will be the difficulties inherent in combining the country's various networks into a single logical net. That net, she says, must look roughly like this: cable's broadband coaxial to the home or fiber to the office, a local backbone of fiber provided by the local carriers and fiber-based interexchange carriers tying it all together. It will be completely digital and will have jettisoned circuit switching in favor of packet switching.

This kind of solution makes the most economic sense, Fjeldstad says, because it takes advantage of each existing sector's current strengths.

For example, one barrier to multimedia in the home has been the high cost to the carriers of installing fiber cable to every home.

But this investment has been made unnecessary by the widespread installation of broadband cable into the home by cable companies over the last few years.

Her hope is that the various carriers and cable companies will be able to avoid these kinds of turf wars because they could confuse consumers, result in multiple nets rather than a single logical net and, in the end, postpone the competitive advantages to be enjoyed by the country that gets its networking house in order first.

"My message is that this is the lowest cost solution because each existing sector specializes in its current strengths," Fjeldstad says. "The technical part is the easiest.

PHOTOGRAPHY JEFF SHEID

"The good news is that all the telecommunications companies are thinking about moving to digital — the long-distance carriers, the cellular guys, the satellite guys, the [regional Bell holding companies] and the cable companies. And they are all to the point where they believe that circuit-switched technology might be fine for voice but you need to get to packet-switched technology to be efficient moving full-motion video around. We may find that as they all move to the new world, they will start speaking the same language and getting to the same types of technology."

"I can see enough to know that this is a very good business for me to be in."

But Fjeldstad sees another hurdle that lies ahead: regulation.

"The real question that remains, the one that will make this world happen or explode, is the deregulation of the phone companies," she says. "This is needed so that everybody will get to play in the same game under the same rules.

"If the phone companies and the cable companies are both deregulated, then they will both be able to get into the new world of interactive services equally and they will be able to realize the advantages of partnering. Some people think I'm Pollyanna, but I do think this is possible."

Right now, portions of Fjeldstad's vision are being put to the test on a small scale.

Just over a year ago, IBM announced plans to put its new switching and routing technology to a commercial test in Toronto. IBM, partnering with Rogers Cable T.V., Ltd., began installing a new generation of switches, dubbed PARIS, on top of Rogers Cable T.V.'s existing fiber-optic lines. PARIS is a fast packet switch based on a rack-mounted RISC System/6000 Model 930 with a 6G bit/sec bus and special adapter cards. The result is a 6G bit/sec backbone supporting 1.2G bit/sec fiber rings based on a new IBM protocol, Optical Ring using Buffer Insertion Technology.

So far, two of 20 banks slated to be connected have been linked to one another using PARIS and fiber. Thus, the commercial viability of this small-scale test has yet to be measured.

But Fjeldstad notes that the test does not represent a true trial of her vision because it is limited to a small geographical area. This rules out the kinds of cost savings that will accrue by eliminating travel over large distances.

Although IBM's technology is only now being implemented in small tests, such as the one in Toronto, Fjeldstad is confident that within just a few years, the single gigabit-speed logical net capable of handling multimedia applications is likely to be in great demand by businesses.

While shrugging off the label "missionary," Fjeldstad nonetheless paints a picture of a forked road, where one path is marked by cooperation and leads to new applications, increased productivity and U.S. economic might. The other is marked by squabbling and potentially leads to the loss of key U.S. strengths to more savvy nations.

"Even though there is a lot that is unsure here, I can see enough to know that this is a very good business for me to be in," Fjeldstad says. "I'm not going to wait for the killer app to show up before I get started. What we're talking about is the coming national digital gigabit multimedia network that you really have to think of as the intercontinental railroad of the national telephone system of the future."

If the multiple interests fail to get together and take the required steps, she says, "it could give a lot of other countries the chance they need to move right up our tailpipes. I just hope I don't wake up one of these years to find that Japan has beat us to the punch again by spending $250 billion to rewire their country [while] we couldn't get everyone here to work together." ◆

Nitzsche is an associate features editor at Network World.

ROYCE HOLLAND

Sparring with the monopolists

Competition-minded MFS president says the RBHCs don't pass the 'scratch-and-sniff' test of good public policy.

On paper, there was no reason why local exchange service had to be a monopoly.

In the early 1900s, many communities in the U.S. had competing local carriers. So why had local exchange competition become all but extinct by the time World War II ended?

To Royce Holland, president of MFS Communications Systems, Inc., it was clear that competition hadn't died a natural death. Rather, it had been driven into hibernation by political forces shaping the country in the early 1900s.

Holland has set about trying to prod competition back into life, and during the past five years, he's fought his way across a landscape of controversy, legal maneuvering and stonewalling to open up a corner of the Bell company monopoly to competition.

Many have compared MFS Communications' battle to the efforts waged by MCI Communications Corp. a decade ago to open up the long-distance industry to competition.

"There's nothing natural about a monopoly in the local exchange," Holland says. "In fact, if it were a natural monopoly, Western Union [Corp.] would be operating the telephone system today because they really started out providing local telephone service at the end of the 19th century."

In Holland's view, the local exchange was molded into a monopoly primarily by two people — Theodore Vail, chairman of AT&T, and J.P. Morgan, a huge investor in AT&T.

"The Bell system in the early 20th century was able to force many of the independents to sell out, and [it] very rapidly assembled a monopoly," Holland says.

Holland, an electrical engineer by training, figured that if the process worked in one direction, it should to work in the other.

PHOTOGRAPHY NEIL MACDONALD

So in 1987, Holland recommended to his firm, Peter Kiewit Sons', Inc., an Omaha, Neb.-based multibillion-dollar construction and mining company, that it should spin off a communications subsidiary.

"All of us had the feeling it was more a matter of when, rather than if, the local exchange would be opened to competition," Holland says. "The fact that the dominoes had already fallen on the long-distance monopoly helped make it inevitable that they would fall on the local exchange monopoly."

That may have been true, but Holland admits that few people outside his own company believed it.

"Back in the 1987-88 time frame, there were not very many people who shared the view that the local exchange would be in a natural progression toward competition," he adds.

Since it was formed in 1987, MFS Communications has proven doubters wrong by battling with regulators and carriers to open the local loop to greater competition. MFS Communications began as a provider of interstate access services.

It wired buildings into its fiber network and carried user traffic to a long-distance carrier's central office. In this role, MFS was not considered a local carrier and could operate without going through an elaborate regulatory process.

Today, MFS Communications has fiber nets in 12 metropolitan areas, including Chicago, Houston, Los Angeles and New York, with two more under construction with completion to have occurred at the end of 1992. Each serves 900 buildings in each of those cities, which includes more than 500,000 square feet of Class A office space, with fiber — more than any single regional Bell operating company (RBOC).

But despite that progress, Holland says MFS Communications and other companies like his were able to compete for only one-half of 1% of national access revenue. The company wanted to negotiate deals with the Bell companies that would enable it to pick up private-line traffic from buildings not wired into its fiber network.

The RBOCs listened politely but didn't budge. "We had almost no negotiating leverage with the RBOCs," Holland says. "By and large, they just slow-rolled us."

If MFS Communications was to expand, it needed help from the regulators. The company began with state regulators but didn't get far. "Many state commissions were openly hostile to competition," Holland says. MFS Com-

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By Anita Taff

AUDREY MACLEAN

Fashioning a high-speed network

The cofounder of NET and Adaptive wants you to catch the wave of ATM and SONET.

PHOTOGRAPHY DAVID POWERS

Here's a test. Name all the chief executives of companies in the network industry who are women. If that wasn't hard enough, now name all the chief executives of network companies who are women and former fashion models.

If you said Audrey MacLean of Adaptive Corp., consider yourself an expert in high-technology trivia. MacLean cofounded T-1 market leader Network Equipment Technologies, Inc. (NET) and now heads Adaptive, a maker of Asynchronous Transfer Mode (ATM) and Synchronous Optical Network (SONET) broadband switches.

MacLean has become a leading proponent of high-speed networking, which is a far cry from the world of high-fashion modeling she once knew. While a student at Long Island University, she took off a year and a half to model in Paris.

MacLean landed in France "mostly, as they would say in French, 'pour m'amuser,' to amuse myself," she says. "But I lived and worked there as a model. It was intentionally transitional; it was for fun."

MacLean didn't have a lot of time for fun growing up. The eldest daughter of 10 children born to a U.S. Merchant Marine officer and a New York City Metropolitan Opera singer, MacLean recalls a childhood filled with studying and babysitting in the upstate New York town of Warwick.

"As the oldest daughter, I pretty much worked around the clock from my earliest recollections," she says.

Nonetheless, MacLean did manage to squeeze in enough time to play basketball, piano and french horn, and to participate in her high school's debate team, math team and marching band.

She may have even had fun doing school work. Math was MacLean's favorite subject and not just because of the sense of accomplishment in solving equations. "When I was growing up, math was the great equalizer," she says. "If you could beat the boys at math, they'd respect you. Now there's two: math and Nintendo."

After high school, MacLean turned to Long Island University to continue her studies and then to Paris to turn heads. Upon her return to the states, MacLean went to California to complete her course work and obtain a bachelor's degree in mathematics at the University of Redlands.

After graduation, MacLean went to work for Tymshare, Inc., a Cupertino, Calif.-based provider of time-sharing services to engineers and businesses. She began as an application engineer, tailoring computational access and functions to customer needs.

MacLean's experience working with Tymshare clients taught her a lot about running a business. "Money not being that plentiful, an MBA was out of the question," she says. "This was a good compromise."

The Tymshare experience also helped shape MacLean's networking career.

In addition to providing compute cycles to businesses, Tymshare was engaged in another project, called Tymnet.

Tymnet was originally established to serve Tymshare's business of parceling out compute power and providing access to centralized hosts. But as businesses grew, their computational needs grew and their applications became too strategic to farm out to a time-sharing service provider.

So Tymshare set up Tymnet as a separate business and, as MacLean puts it, "pioneered" the private X.25 switching market with sales to users such as TRW, Inc. and Bank of America.

MacLean then "left" Tymshare to work for Tymnet.

"I became more interested in the communicating portion of the problem as opposed to the computing portion," MacLean says. "I wanted to realize the potential of some of the underlying technology they were working on."

At one point during her nine-year tenure at Tymshare/Tymnet, MacLean and some of her associates conducted an experiment with Satellite Business Services to send a megabit of data from San Francisco to a customer site in New York using a digital satellite link. The experiment took place during the time of AT&T's divestiture and the deregula-

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By Jim Duffy

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tion of the telecommunications industry.

MacLean, who was responsible for Tymnet's western regional sales and service operations at the time, was overseeing the customer's involvement in the data transmission experiment. She was also watching the break up of AT&T very closely.

"I was tuned into the implications from a tariffing standpoint of the breakup," MacLean says. "It became pretty clear that many of the carriers were going to compete directly with AT&T in terms of offering bulk bandwidth to corporate users."

With that market shift in mind, MacLean left Tymnet in 1982 and developed a business plan for NET. NET received funding in May of 1983 to manufacture, sell and service T-1 multiplexing equipment.

But it wasn't long after NET's start-up that the information industry began to change again. Personal computers were popping up on desktops at an alarming rate, distributing compute power across enterprises. Those desktops were being connected to local-area networks. Fiber was being laid in the ground. And semiconductor and memory prices were dropping, making transmission and switching equipment — as well as bandwidth — less expensive and more attainable.

> "If you're going to truly support client/server computing, it's necessary that the network evolve," MacLean says.

Users were beginning to explore distributed applications that could take advantage of the MIPS available on desktops as well as new multimedia applications that could leverage the power of their enterprise networks. What's more, the future held the potential of a convergence of local- and wide-area networking technologies through such things as ATM.

The age of broadband networking was dawning, and the X.25, time-division multiplexing and LANs already in use had to evolve.

So in 1989, MacLean cofounded and became chief executive officer of Adaptive, an NET subsidiary chartered to meet the broadband networking needs of large corporations, as well as local and interexchange carriers.

"If you're going to truly support client/server computing, it's necessary that the network evolve," MacLean says. "The network has been the major bottleneck, and it's role should be to be an application delivery infrastructure. The more distributed those applications are, the more burden there is on the network to be able to support that."

To relieve that burden, users will gradually — over the next three to five years, MacLean says — migrate their LANs and WANs to ATM switching and SONET transmission infrastructures. So will carriers. In many cases, the migratory patterns of the customer premise and central office have already begun, MacLean says.

ATM will emerge first in the local area, MacLean says, because LANs have greater bandwidth requirements and are more difficult to manage when interconnected by bridges and routers. Present-day packet-oriented LANs will at first coexist with ATM cell-switched LANs, sharing the same physical infrastructure.

Over time, though, when the majority of user applications need higher throughput switching and higher bandwidth lines, ATM LAN switches will replace shared-media hubs, she says.

While that's happening on the local area, carriers will slowly evolve their wide-area transmission fabric to SONET, according to MacLean. Users of T-1 multiplexing equipment will upgrade that gear with T-3 SONET interfaces, and carriers will migrate their digital access and cross-connect systems to SONET-compliant gear.

Once carriers make the transition to ATM switches, some of the more recent packet-switching services, such as frame relay, will also be superseded by ATM, MacLean believes.

Are ATM and SONET, then, the be-all and end-all of enterprise networking? Or will the industry reinvent itself once again later this decade?

"It will be a very long time before we see something that supersedes ATM," MacLean says. "Sometime in the next millennium there will be new requirements that push the envelope of network architectures. But there's nothing from an R&D standpoint right now that is a contender." ◆

Duffy is a senior editor at Network World.

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Sparring with monopolists

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munications was able to make some headway with regulators in a few key areas but only after several years of negotiations.

In 1990, MFS Communications decided to attack the problem at the federal level. The company filed a petition in December asking that it be allowed to collocate equipment in Bell central offices so it could pick up traffic from any building served by that central office.

In September, the Federal Communications Commission granted MFS Communications' request, saying competitors could collocate equipment in the Bell central officers to pick up private-line traffic bound for the long-distance carriers.

The FCC has proposed a similar arrangement for switched access services, but it will probably be a year before that is allowed.

Holland believes the FCC's endorsement of competition in the local loop will spur state regulators to follow suit. "I think we will see things accelerate in the regulatory process over the next few years because the market is really going to be driving that," Holland says.

Already, the state of New York has ordered New York Telephone Co. to allow collocation of private-line and switched access for local services. It has also ordered the local company to unbundle Centrex, private branch exchange trunks, and business-line links and ports. "This starts to pave the way for a lot more competition in basic local dial tone for businesses," Holland says.

As for the future, Holland says MFS Communications wants to continue to expand its operations. "We want to be able to compete for a full range of services — from local exchange service to originating and terminating switched access to enhanced Centrex," Holland says.

In addition, the carrier intends to continue rolling out new data services such as its local-area interconnection service and Asynchronous Transfer Mode switching service.

And Holland predicts major changes for the local carriers. "Companies like the Bells are still largely focused inward, or backward, pining for the days of the natural monopoly instead of moving forward in an emerging, competitive environment," he adds.

But that may change shortly.

"Within the next two to three years, you're going to see RBOCs crossing out of their own service territories to get into the competitive access businesses in other service territories," Holland explains. "And I think you're going to see one or more of the RBOCs voluntarily surrendering the monopoly over some period of time in exchange for more regulatory flexibility and maybe an end to the MFJ line-of-business restrictions."

Holland's success in tackling the Goliath local telephone industry was due in large part to his status as an outsider to the industry. Unlike people working in the industry immediately after divestiture, Holland did not grow up in the Bell system or any other phone system for that matter. His background was in alternate energy, an area that was predicted to boom but largely sputtered after political backing and funding disappeared in the 1970s. There were a number of small firms trying to develop new energy production systems that were seen as competitors to the old, established electric utilities.

"There were a lot of lessons learned in [alternate energy] as well as in competition in long-distance that were applicable to the local exchange," Holland says.

Coming from outside the industry, Holland also had no idea how difficult it would be to convince others that the local loop should be opened up to competition. His first challenge was to get customers to use an upstart carrier. "Back in 1987 and 1988, the competitive access industry was very unknown," he says. "You were fighting the old adage, 'No one ever got fired for using Ma Bell.' "

Initially, MFS Communications was generally consigned only small pieces of business as an emergency backup service.

But the company began to turn the corner in 1990, signing up large accounts such as Bear, Sterns & Company, Inc., the Social Security system's call answering center and Maryland Casualty Co.

"Now we expect to go in and get the lion's share of the business," Holland says.

What else would you expect from someone who feels he's on the side of righteousness? "I firmly believe competition in the local exchange is good public policy," he says. "We really have to advocate positions that are good public policy. A lot of things the RBOCs are advocating do not pass the scratch-and-sniff test for good public policy." ◆

Taff is Washington, D.C. bureau chief at Network World.

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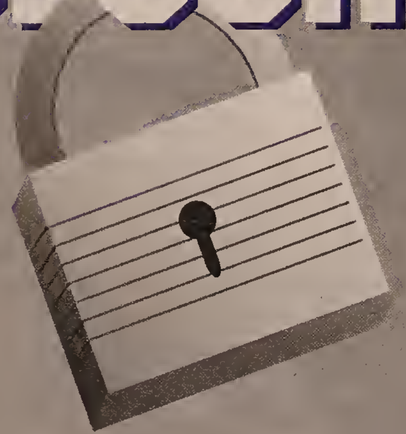

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JOHN PUCKETT

Open Sesame

Foxboro's network guru gambled and won with open systems. Now he wants more from network management.

PHOTOGRAPHY JOHN THOMPSON

For the past five years, John Puckett has architected and led his team to build an open systems-based multivendor network at The Foxboro Co., and for five years, he's found himself trying to second-guess the future.

The first major decision Foxboro, a manufacturer of process control systems in Foxboro, Mass., faced was whether to adopt the Manufacturing Automation Protocol, Open Systems Interconnection protocols or the Transmission Control Protocol/Internet Protocol as the foundation for its new network. At the time, none had a clear advantage in user nets.

Puckett, who is manager of engineering and network services at the company, took a deep breath and chose TCP/IP, with the added intention of moving to OSI as it became available.

"People ask me how on earth did I have that vision five years ago," Puckett says. "No one knew at that time, and we had to bet the store on it. I can tell you, there were many sleepless nights."

The key to that decision was being able to gather good information from a variety of sources, such as user groups and conferences, he says. Some savvy reasoning also played a part.

"TCP/IP was already out there in the government networks; it was on the Internet. And it was very clear that the government had a commitment to go to OSI, with [Government OSI Protocol]," Puckett says. "We could see that the full solutions were available for TCP/IP, and I figured if I could get to where the government was with TCP/IP, they would provide the stepping stones to OSI — at their cost."

Now that the network is in place and a success, Puckett, who came to Foxboro by way of several engineering jobs in the U.K. and Australia, is once again trying to gauge the future. With a network that enables anyone in the corporation's 11 locations worldwide to access any server and print device at any time during the day or night, he and his team now finds they are focusing more on applications such as network management, network operating systems and software licensing issues.

"Network management today is crude and primitive," Puckett says. "It's purely an information gathering system at this point in time, and in my opinion, management is not management unless you have control."

Puckett, who holds a patent in Australia for a switch that can remotely monitor control valve positions in hazardous areas, says that coming from a process control systems background has given him insight into how the next generation of network management systems should operate. Puckett says tomorrow's network management systems should also be able to allocate bandwidth in real time, giving precedence to mission-critical applications while throttling down less important users.

"I think it's feasible that we will have SNMP agents in every Ethernet board of every device on your network," he says. That would give users the ability to ramp the I/O through Ethernet boards, scaling back bandwidth to users running less critical applications and redirecting it to those who need maximum throughput.

The network management system would decide which applications get bandwidth precedence by consulting a hierarchical database, which might have mission-critical just-in-time manufacturing applications weighted more highly than less important word processing applications.

"The net management system would sense the loading of the network and figure that, based on the current rate, the mission-critical applications are going to experience a problem soon," Puckett says. "Then it would take automatic proactive action and throttle the output of the non-mission-critical applications to make bandwidth available to the mission-critical ones."

If each non-mission-critical user was throttled back 3% to 4%, it would be enough to clear the way for the mission-critical applications without disrupting other users too much, he says.

An automated capability like this is extremely important in a global network such as Foxboro's because it would make operator intervention unnecessary in this area, Puckett says.

Another application Puckett sees for the near future is a corporatewide software licensing broker. "I think there has to be a much simpler way of managing software licenses," he says. "Eventually, software companies will have to develop a common way of concurrent licensing that is fair and equitable for users and suppliers, and I think that technology will be license brokers."

He said he envisions this license broker as software residing on a server that can broker licenses for any application, "irrespective of whether it's DOS, Windows, NT, Solaris, Unix or MPE — it will work across multivendor platforms."

When users need to update or load new network software, they will just need to load it on the license broker. The broker will then interrogate each device on the net and authorize use for the previously set number of users.

Another supporting factor for the creation of this license broker also has to do with managing a global enterprise, Puckett says.

"When folks are sleeping in one part of the world, software licenses could be transferred to employees working in another geographical area," he says.

Long term, Puckett says Foxboro is looking at the network operating systems of the future.

"DOS-based NOSes have served their useful life," he says. "There needs to be something else, and I believe it will be a combination of [Sun Microsystems, Inc.'s] Solaris and [Microsoft Corp.'s Windows] NT."

He said the requirements will be the ability to offer power users multiprocessing and a choice of hardware platforms for distributed computing.

"The winners will be those companies that can provide the maximum number of applications to satisfy users' needs," he says. "Not who necessarily has the best technology. And that's where I see Microsoft and Solaris finding their own niche." ◆

Cummings is a senior writer at Network World.

By Joanne Cummings

Interoperability is Job 1

continued from page S17

is somewhat of a hybrid between the Internet, where the Internet Engineering Task Force only works from existing technology, and ISO which got into the business of inventing by committee. They turned out a lot of camels instead of racehorses.

The only difference with the Internet approach is that we reserve the right — if we see pieces that have the potential to complement each other — to undertake an integration phase at the end, to glue various pieces together.

Won't losing the RFT process slow a vendor's implementation of DCE?

Gossels: It could, if they let emotion get in the way of business decisions. But DCE has been licensed by every computer company around the world. Only seven companies had technology included.

When we pick the right thing, those other aspects fall by the wayside. If we were to let it get political, so that the end product wasn't the right answer, then the prospect you raise would be true. But if you are trying to serve the customer, someone has to make some tough decisions and say: 'This one really is better.'

It is also fascinating how the process can put someone on the map. For example, Tivoli Systems, Inc., whose object technology was chosen in the DME process.

Gossels: We put Tivoli [Systems, Inc.] on the map, we put Transarc [Corp.] on the map. We picked the [Tivoli] technology because it was the best technology. Our real concerns were that there is a substantial amount of work to do on that technology before it is product-ready. It's a tiny company, and we are asking it to undertake major development work. Would they be around to finish the job? Were we putting the whole program at risk? We felt good about taking an underdog, an unknown company that really had a better idea, and being able to choose it.

At some point does the need for an OSF vanish?

Torey: Yes, it could but I see no likelihood in the short term. As we move up, holes in our platform open up because people's use of it expands their need for functionality from it. By the end of the decade, we've got a whole new set of requirements. There is going to be this constant need for the evolution of this platform.

Gossels: As long as the end-user community wants to have a say in steering their future and their use of technology, an organization like OSF has to be around to solve those multivendor problems. ◆

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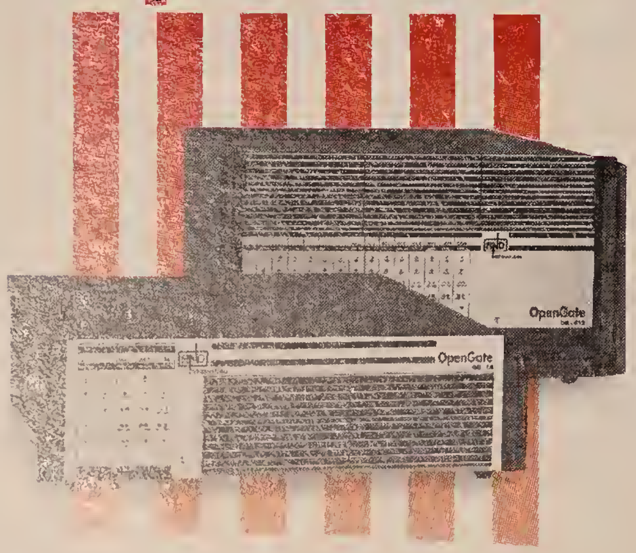

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Fighting for justice on the new frontier

continued from page S22

ed. And a fair-minded reading does not make the FBI look good because there is nobody speaking up in favor of them except them.

Where's their support? Probably the most supportive thing anybody has said is what I've just said: Where's the real issue here? We want to work on the real issues, we want a dialogue.

Should we be concerned about the NSA's role in encryption?

There is a need to rationalize national security policy in light of the end of the Cold War, especially because there are now non-defense-related interests in encryption, the privacy interests we've spoken about.

So there needs to be ongoing dialogue involving all the parties, including the NSA, on liberalizing restrictions on export of encryption software.

The NSA only enters into this with respect to export controls — you can do whatever you want domestically. But given that we live in a global economy, businesses make the point — and I think it's a reasonable point — that they don't want to have two different product lines. They want to do one product line with a uniform set of capabilities.

There was a partial liberalization so that a short-key RSA [algorithm] could go through an expedited review. It's a foot in the door. It will make a material difference because it sets a precedent. It's a first step, and if it doesn't lead to subsequent liberalizations, then it will have been in vain.

The EFF has a Washington, D.C. office headed by Jerry Berman, and a Cambridge [Mass.] office, where director Cliff Fragallo — who used to run The Well computer conference system in San Francisco — is organizing new local EFF chapters specifically for users.

[For EFF membership information, call (617) 864-0866 or message EFF on the Internet at eff@eff.org.] ◆

ENVISIONS

By Scott Bradner

On the threshold of a new year, things are looking semi-good in the data network biz.

Fast networks are finally getting here. On the local-area network side, Fiber Distributed Data Interface is becoming cost-effective, particularly on unshielded twisted pair. There is talk of 100M bit/sec Ethernet, although that seems a bit magical.

Asynchronous Transfer Mode (ATM) LANs are just around the proverbial corner. Looking at the world of wide-area networks, ATM is a bit chancier. But the new National Research and Educational Network proposal from the National Science Foundation (NSF) offers the potential of unlimited data rates. In reality, the rate is 155M bit/sec, but that is so much higher than anything most people are using that it might as well be unlimited.

> "The legal impact of a major Internet incident that would destroy data is hard to overestimate."

Also, nets are getting more reliable. The use of the Transmission Control Protocol/Internet Protocol routing protocols Open Shortest Path First and Border Gateway Protocol provide quick convergence with redundant pathways in a way that has been missing in networks based on the Routing Information Protocol and Exterior Gateway Protocol. Availability of fault-tolerant routers with hot-swappable features may even persuade the keepers of large Systems Network Architecture networks to start migrating to the multiprotocol world.

That will be aided by a standardized method to transport SNA across TCP/IP nets. Since IBM and Cisco Systems, Inc. will be offering proposals to the Internet Engineering Task Force in this area, progress shouldn't be too far away.

Apple Computer, Inc.'s AppleTalk Update Routing Protocol may make it possible to reliably operate the corporatewide AppleTalk nets that are already here. Now if only Novell, Inc. would come up with a similar version for its Internetwork Packet Exchange (IPX).

Computing and net equipment are getting much more powerful, too. There are now routers that are more powerful — in a million instructions per second sense — than mainframes from just a few years ago. For what people paid for a personal computer five years ago, they can now get a machine with the power of a mainframe from five years back. What's more, the move to public key encryption and digital signatures will make many security problems disappear.

Whatever one's political persuasion is, having a new vice-president of the U.S. who is interested in data networking may portend a greater interest in the technology and in making more governmental information available on-line.

All is not rosy, though, since there are still some difficult problems to confront. We're in the midst of a major discussion about the addressing, routing and congestion issues with the Internet that will prove fatal to the prophesied billion-node network of the future.

In the nontechnical arena, we have the issue of defining and protecting privacy, exemplified by the "who owns E-mail" debate, that becomes more critical as more personal information is made accessible over networks.

Even with all of this technical Brownian motion and the too-often emotionally charged debates on methods to address these and other problems, one might be able to make some moderately reliable — or at least believable — predictions on future directions were it not for three things blurring our vision like fog on a highway: lawyers, businessmen and politicians.

The legal impact of a major Internet incident that would — unlike the famous Internet worm — destroy data is hard to overestimate. If it can be proved that design or implementation flaws in computing or network systems have facilitated the damage, vendors could find themselves with significant legal liability.

If Unix International, Inc. is successful in its suit against BSDI, Inc., the majority of the software used on the Internet could become legally questionable.

One can never predict how businessmen will act. There are currently several proposals for many types of Internet services. If these are pursued with the same kind of vision as Integrated Services Digital Network has been in the U.S., we may soon find ourselves using tin cans and string.

Finally, the political process could have a major impact, either positive or negative. The proposal to force the inclusion of a "trapdoor" in U.S.-produced encryption equipment could easily mean that little or no U.S.-produced security equipment would be viable in the international marketplace.

Another example is the debate on the Appropriate Use Policy of the NSF Network. If the current pressure to remove the usage restrictions on the net succeeds, there will be little rationale for the private sector to invest the large sums of money required to create a national network infrastructure since Uncle Sam will offer the service for free.

Still, with a new year coming and a change in political leadership, I'm hopeful. But maybe that is shortsighted. The future of data networks goes beyond the next year or two, and, in the longer run, the path taken will depend more on the services and functions made available than on the specific technologies employed. We shall see. ♦

Scott Bradner is a consultant with Harvard University's Network Device Test Lab in Cambridge, Mass. He can be reached via the Internet at sob-@harvard.edu.

ENVISIONS

By Mary Johnston-Turner

It's hardly believable. The hot issues of 1992 have become a low priority. They've been masked under layers of distributed multimedia applications and collaborative group computing. Intelligence embedded in customer premises equipment and software are working together to bring sophisticated information services to the naive user who never before considered using high-tech computers and communications.

Users no longer have to adapt to the limitations of their information access devices, such as telephones, personal computers and workstations.

Low-cost info-tainment terminals are bringing voice, data, video and image to most homes. Personal communications service is providing access to information anytime, anywhere.

Consumers as well as small businesses now have access to computing power and applications that were formerly far outside of their price range. Corporate data applications are routinely extended to the home and small business as electronic shopping malls become the rage.

Using on-line multimedia terminals in their home info-tainment centers, consumers order videos on demand, perform banking transactions, and shop for clothes over display, order and delivery networks, which are putting the pinch on traditional distribution channels. Additionally, interactive video games are pitting players from all over the country against one another in dramatic simulated battles and adventures.

> "Users no longer have to adapt to the limitations of their information access devices, such as telephones, PCs and workstations."

Distributed applications are mixing and matching information from a variety of data, video, image and voice servers linked over flexible interenterprise internets.

Breakthroughs in graphical interface standards, application program interfaces, object-oriented software, and systems that link databases and services are enabling the network to detect the type of customer premise equipment from which the user is calling. The network then adapts to the device's protocols, flow control and user interface requirements before presenting information in an appropriate format.

Speech-activated intelligent agent software resides on most customer premises equipment. The agents search databases, collect and filter information, and deliver it to the user. Natural language speech-recognition and stylus interfaces minimize the need for keyboard literacy in this world and contribute to the explosion of mass market network services.

Text-to-speech conversion really works, and users now opt to have electronic mail read to them or voice mail printed out, on a message-by-message basis.

Network transmission and switching infrastructures are highly stable. Very high speed cell-based transmission and high-capacity cable as well as fiber distribution systems eliminate bandwidth bottlenecks. Network-based intelligent flow-control systems detect application bandwidth requirements and route connections over the appropriate facilities transparently.

Network and human interface standards, often developed by industrywide consortia, support this flexible, intelligent internet. Competition from wireless and cable TV systems in the local loop have driven down costs and improved service quality.

In fact, low-cost personal wireless communicators are now found on watches, making it easy and affordable for everyone to stay in touch. Standards ensure that the myriad of wireless carriers can easily interconnect with one another as well as with wired carrier systems.

Global interexchange carriers are providing uniform service around the world. Most users are relying on public carriers and outsourcers for their network infrastructure support requirements. That is because public networks are more reliable and cost-effective than all but the largest private network alternatives.

Tools for managing net components and networked systems such as software, customer premises equipment and user support are interoperating smoothly. These management systems are not only detecting faults, but they are also taking advantage of artificial intelligence to execute most diagnostic and repair procedures automatically.

The vendor community has also figured out that working together to satisfy users is the way to go. Vendors are happy to take responsibility when services and equipment don't work as promised, and finger-pointing has been completely eliminated.

Information technology professionals are able to concentrate on working with business users to enhance productivity and develop new information-based products and services as core technologies are more than adequately supported by the vendors.

Welcome to the year 2002. It's about time that we finally accomplished all the things we said were possible back in 1992. ♦

Turner is a principal with Northeast Consulting Resources, Inc. in Boston, creators of Future Mapping, an interactive process for developing long-term network and information technology visions and real-world implementation plans.

ENVISIONS

By Rich Finkelstein

The promise has been made. Users have been told to look forward to a new generation of networked database management systems that will make distributed data available when it is wanted, where it is wanted and in the format it is wanted.

This is not an unreasonable promise to make. Someday, such a DBMS will indeed be available and the key enabling technology will be high-speed networks, which can quickly and efficiently move massive amounts of data from source to requestor. Another enabling technology will be multimedia data.

Already, we are witnessing the introduction of even faster networks and the transformation of data from bare bones text to exciting new multimedia data. Indeed, a few years from now, images, graphics and audio will replace text as the preferred method for storing data. Data in graphic form is easily understood and more usable, creating new opportunities to put data in the laps of the ultimate user — the consumer.

For instance, a couple in the market for a new home will someday use a personal computer or specialized terminal to easily access photos and detailed audio descriptions of a house and neighborhood from a remote real estate broker's database.

Potential buyers could browse through images of houses and listen to audio descriptions of them in the convenience of their existing dwelling. Not only could they look at pictures of the home's exterior, they could zoom in on interior rooms or look at schematics.

Interested consumers could easily send an electronic mail message to the broker to arrange an appointment, negotiate terms, complete paperwork or even close the deal.

This whole process would save time and money for both the broker and the buyer. It would also enable the real estate firm to complete more transactions than currently possible.

Likewise, this technology will further automate the purchase of clothes, gifts and other consumer goods. Network service providers can bring the look and feel of a shopping catalog right onto a consumer's workstation screen by displaying product images and groups of products for better comparison buying. Catalogs could be enhanced by providing more information than is currently available in printed form and by showing different models and views of the product.

This type of direct hookup between the customer and the database is not feasible at this time because of the high cost and slow speed of network transmission. But carriers are planning to bring high-speed lines right into the home.

On another front, we will see organizations begin to tap into each other's networks to create interorganizational database sharing.

A travel industry database, for instance, could combine airline, hotel and car rental applications so that a customer and agent can perform all of their work with a single point of interaction. A unified database not only speeds up initial reservations, but also simplifies the process of changing itineraries — a boon to the customer and agent.

Consortiums trying to integrate industry related databases are already in place. While progress is being made, advancement efforts are ongoing.

All these trends are corroborated by current ongoing database development activity.

Yes, the process is slow and evolutionary. Organizations not only have to build new systems to support these types of applications, but they also have to reengineer their business processes.

It will also be necessary to put in place new technologies such as object-oriented databases to manage the multimedia data and new types of application developments that will make it easier to build these very complex applications.

This is a new and exciting age in database management, and while the challenges are great, the rewards are enormous. I am and users should be looking forward to DBMS advancements. ◆

Finkelstein is president of Performance Computing, Inc., a consulting company in Chicago that focuses on client/server and rightsizing applications.

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ENVISIONS

By John Rymer

Visualize today's expanding lattices of interconnected local-area networks and corporate backbones as an office campus. Today, the typical business user is confined to a single room on that campus.

Currently, most users have access to a local file server, mainframe application or database. In this environment, the impact of networks on the business user's productivity and effectiveness is seriously circumscribed.

The promise of networking is to provide access to data and computing functions to an office campus that stretches around the globe. The goal is to solve business problems with greater speed, at lower cost and with wider reach than users enjoy today.

Over the next decade, net technology will develop to the point where users can easily gain access to worlds of data and the real assistance needed to solve business problems. The scale of these networks will be global, but users will find working with them as simple as if they were working on a single computer.

Users will also be able to tap cross-tabulation and other complex filters on diverse data sources. Correlating data from a customer file on a mainframe, order information from a relational database on a LAN and an image from an image database on a specialized server will also be possible.

Lastly, access to a variety of services, including graphics rendering, analytics, printing and even basic communications, will be much easier with the use of common network-based facilities.

This vision of the future doesn't require migration to a broadband networking technology. Ironically, bandwidth is a minor issue. Instead, the major obstacles for this vision are user interface, security, economics and software development.

Global access to data and functions will require more sophisticated user interfaces than we have today. These interfaces will help users explore unknown data sources and services as well as well-known resources in new ways.

Global access will require careful net security. If a user accesses remote data, the owner of that data must be confident in the user's legitimacy. Achieving this level of security will require investments in new directory and related authentication and encryption software, as well as carefully considered security policies.

The economics of global networking will be complex. Today, costs are too high and often concealed from users. While users can see the gross costs of maintaining internal databases, they know little about the operational costs related to those databases. For external data, costs for connect time and access fees will only decrease when more users make more regular use of on-line data sources than they do today.

For this to happen, however, the industry needs a computer-assisted market that fields requests and recommends resources to satisfy them while also revealing pricing and usage policies.

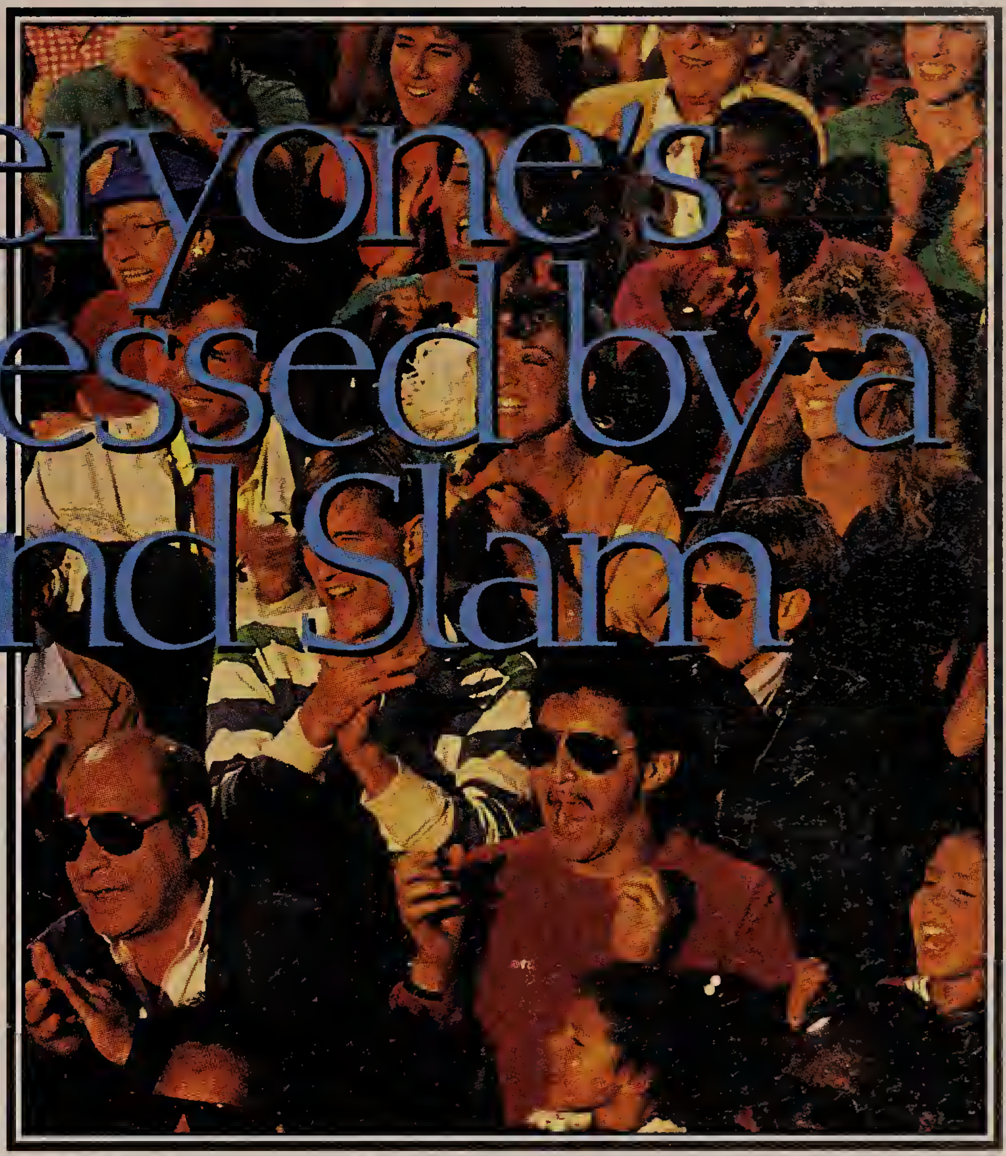
Furthermore, we haven't yet figured out the right balance between the need to make the network transparent and the need to inform users of the implications of net operations.

For example, users typically don't know how much it costs to perform a specific network function, such as a database query. As a result, they often submit queries that unnecessarily chew up processing time and other resources. In the future, these users will need to refrain from such practices.

Software development and packaging are a crucial factor in shaping global networks. If data and services are implemented in ways that load up networks with control information to support every session, progress will be slow. The best approach is to invest in software that interacts using small asynchronous messages that will wring greater utilization out of today's bandwidth.

What is most interesting about this vision of future networking is just how close it is. Most of the technology needed to reach this vision is available now. We just need to implement it. ◆

Rymer is vice-president of the Patricia Seybold Group, Inc., editor in chief of Distributed Computing Monitor, *a monthly research report, and chairman of Patricia Seybold's "Marathon Week," an annual conference on distributed object computing and open systems.*



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NETWORK WORLD

Apple lays out net future of System 7

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Market flux forces users to rethink int'l hub sites

IDG

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Sources: *The Wall Street Journal*/ICA Member Study, Erdos & Morgan/MPG, 1992; Audience Survey of INTEROP 91 Fall, Exhibit Surveys, Inc.; and Audience Survey of ComNet '92, Exhibit Surveys, Inc.

Power to the people

continued from page S38

watches as a crew foreman, who has no data processing background, prepares a work schedule using a networked application to retrieve data that reflects up-to-the-minute work load demands. This helps keeps personnel costs down by making sure idle workers are not on the clock. Previously, the foreman had to use historical reports and do some guesswork.

"This was somebody without a data processing background who used the tools — the network, the applications suite — in order to do his job better," Beckman says. "Seeing those kinds of things is the fuel that keeps us going."

Beckman envisions a future in which PCs act as agents on behalf of end users. These PCs will have an intuitive graphical user interface that learns how a user works. This user interface will enable the PC to automatically detect the series of commands a user wants to issue and then automatically issue those commands.

For instance, if a user always logs on to a particular server and proceeds to issue a set of five commands needed to retrieve a certain file, the PC would automatically issue those commands once the user logged on to the server.

At some point, network-attached PCs will be able to prompt an end user when it is time to start a project and map out a course of action the user can take to complete it. For instance, a user who needs to prepare a presentation will one day turn on a PC and get a message that it's time to start putting it together.

Based on data gleaned from servers across the network on how other users prepared similar presentations, the PC would suggest which tasks — such as getting slides and handouts ready — need to be done first.

"A very important part of the computing movement is getting the computer to be an agent that works the way a person works," Beckman says. "We think the workstation-type methaphor, the user interface, the connectivity and the application suite all need to be there to empower a person to do what they need to do. And I don't think we can empower our employees if we were forever dealing in a DOS character-based, command-driven mode. You'd end up having to teach people to become computer scientists instead of linemen, electricians or gas workers."

PCs could also be used as their own educational tools. There will be a day when a user hitting the help button will see a videotape that shows what to do next. "That will be more powerful than calling up a text dialogue box that tries to explain it to you." Beckman says.

Today's shackles

But none of this will happen until users are freed from some technological shackles. Right now, when an application that does not support VINES is purchased or written in-house, Beckman's group must develop the code needed to add VINES support.

For example, in order to add an electronic mail program to client workstations PG&E must buy a package from a vendor that supports VINES or customize the software to work with VINES.

"I've got a Banyan VINES back-end mail engine that is robust and does everything that I want it do," Beckman says. "So, in order to use X vendor's E-mail front end, why do I have to choose a different back end? I'd end up with four or five different mail systems just because of the front ends. That shouldn't be."

The custom code PG&E writes today is known as middleware. "Right now, we're building a heck of a lot of the middleware tools ourselves," Beckman says. "For the next two years, [we'll be] doing a lot of this. I sure hope the industry and standards catch up over the next five years so I'm out of the writing of system software."

Beckman says network operating systems vendors need to create standard network services, or at least standard interfaces, that developers can use in building NOS-independent applications. Toward that end, Beckman was a driving force behind the NAC's establishment.

"I want to get out of the business of having to tailor everything," Beckman says. "There is some hope in a lot of things coming down the path."

Adoption of a standard E-mail application program interface such as Lotus Development Corp.'s Vendor Independent Messaging or Microsoft Corp.'s Messaging Application Programming Interface is a step in that direction.

The day will come when there will be even more standards developers can use when building network applications. Only then will PG&E and other users be able to focus on writing useful and powerful end-user applications instead of middleware.

Getting ready

PG&E will be ready to take advantage of those advances because Beckman and his team constantly update the company's technology vision and spend a considerable amount of time educating employees about that vision.

"I am shocked by how many companies ask us, 'How are you able to do what you are doing?' " Beckman says. "Well, it's because we have a vision and a strategy and it's articulated. We walk it and talk it every day."

Beckman is in the midst of rewriting the 1990 version of PG&E's technology vision. Some 15,000 copies of that document were distributed throughout PG&E. A 14-minute videotape highlighting the key points was produced. Beckman's department has an open house every year to show off its ideas and it produces a monthly newsletter that updates how those ideas are coming to life.

"I sit down with so many other companies and ask them what their [network computing] strategy is," Beckman says. "They kind of give me a few words. I say, 'Can you hand it to me?' And it's not written down. It'll be difficult to move into the future if companies don't write down their goals and educate people on where they are today."

Planning for the future is a lot like planning your day. Taking a little extra time at the start of the day goes a long way toward making sure you stay on an even course to accomplish all you've set out to do. ◆

Brown is managing editor — features at Network World.

An object orientation

continued from page S39

How far along are users with objects today?

Everybody has pilot projects today. Price Waterhouse is writing all internal applications using C++, ObjectVision and Quattro Pro for Windows. They have understood our Object Computing Architecture and are now bolting everything together with it. It's impressive what they've got going over there.

Are users ready for object computing, especially in a cost-conscious business environment that requires immediate payback on information technology projects?

Object computing is where client/server computing was three or four years ago. Every major company is considering it or has some pilot projects going. However, users must realize that object-oriented development is not a magic wand. It's a discipline. It gives you a bigger return on investment, but it's not free or easy.

But aren't users too busy trying to implement client/server computing to begin focusing on objects?

Object orientation helps solve the problems of client/server computing because it provides better development paradigms that immediately benefit any client/server implementation. I would say that client/server is part of object computing. They really work well together.

So you recommend that users embrace object computing at the same time they're developing client/server applications?

Absolutely. Whenever possible, that will increase the productivity of customers in a very clear manner.

What software vendors besides Borland are best positioned to succeed in the 1990s and beyond? Which company's approach makes the best sense?

Microsoft is clearly one. Their size justifies that. Also, companies in niche areas, like AutoDesk will do well.

Lotus Notes is a good work group solution. But it doesn't support distributed transaction processing or large-scale order-entry systems.

And that's what people usually have in mind when they discuss downsizing and client/server computing.

Replication [in Notes] is not a feature, it's a bug. If Lotus could solve distributed database problems, they would never have replication.

The problem with Notes is if you have 200 users, you have to have 200 copies of the same database. Good luck. Replication is not pretty. It's easy to understand, but it's not an efficient way to do things. It works only in very centralized organizations.

What would make vendors cooperate and agree upon standards that would make life easier for users?

We are always cooperating. We worked with numerous vendors, including IBM and Novell, to develop [the Integrated Database application program interface.] We also work with the Vendor Independent Messaging group [and] the Object Management Group. We are always working at promoting and developing industry standards.

Will IDAPI eclipse Microsoft's Open Database Connectivity?

We hope that IDAPI will have a level of ODBC support. You will be able to run ODBC from IDAPI. We certainly hope that Microsoft will participate. We will certainly invite them.

Is IDAPI intended to be a direct assault on Microsoft?

No. We think ODBC is fine. But we need some broad industry standards, not just Microsoft standards. We don't do things to assault Microsoft; it's usually Microsoft that assaults us. Let's not turn things around here.

ODBC only provides Windows access to databases and has fairly limited capability, but it's pretty good. Don't get me wrong, but I think IDAPI will do better.

How many COBOL programmers will make it into the world of objects?

Twenty-five percent of Cobol programmers will remain for maintenance and 25% will become network administrators, guys who are managing the complexity of all these connections. That's difficult.

Twenty-five percent will use visual programming techniques or high-level languages like dBASE or ObjectVision or Visual Basic. The remaining 25% will become C++ engineers.

In the Fortune 1,000 companies, probably 10% to 20% of guys will be superstars doing the C++ programming.

You've been outspoken on the need for technical education. With our educational system in disarray, do you think the U.S. will be able to maintain its leadership in information technology?

As long as we can maintain clear and healthy competitive technology-driven business, the American software and computer industry will do well.

Every child should be taught to program in the same way every child should be taught to add or multiply. Computers are going to have such an impact on the society of the 21st century, every kid should get a class on programming. They should learn how the machines work because these machines are going to control a good portion of their life. ◆

Eckerson is a senior editor/news coordinator at Network World.

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Carriers mum on ATM plans

continued from page 1

announced their ATM strategies.

ATM promises a wealth of benefits for users building local-area internetworks and rolling out distributed applications. But for the technology to really prosper, carriers need to outline ATM deployment and pricing strategies as soon as possible.

If past experience is any guide, getting carriers to divulge ATM strategies may be difficult. Carriers, particularly local exchange carriers, have been known to hold back on committing to widespread deployment of advanced services, such as Integrated Services Digital Network, and instead wait for user demand to develop. That can lead a to perpetual loop problem — demand doesn't develop because services aren't widely available.

Spending on ATM

Figure 1

Market	Millions of dollars				
	1993	1994	1995	1996	1997
CPE	$38	$75	$165	$340	$450
Interexchange net equipment	$24	$60	$80	$80	$80
LEC net equipment	$8	$48	$170	$355	$405
Competitive access provider net equipment	$4	$12	$15	$15	$15
WAN services	$10	$90	$120	$375	$525
Total	$84	$285	$550	$1,165	$1,475

Spending on ATM equipment and services by users and carriers is predicted to rise more than 1,700% over the next 5 years.

SOURCE: GARTNER GROUP, INC., STAMFORD, CONN.

"The lack of carrier strategies is telling us there's no rush to do anything," says Paul Drimmer, a vice-president at The Chase Manhattan Corp. in New York and a potential ATM user. "But this might be a chicken-and-egg scenario. Do we need [ATM service] availability before we start using [ATM], or do we make a commitment to the technology and push carriers to provide services?"

> "Some [carriers] believe there is no credibility to widespread ATM use," Nolle says.
>
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Drimmer says ATM could solve wide-area problems such as LAN-to-LAN connection. "We can't afford [fixed] bandwidth between remote sites, so [lack of action on the carriers' part] is restricting applications," he says.

"Lack of [ATM] in the wide area is hurting everyone except the people who are not making it available," says Brian Bershad, assistant professor of computer science and an ATM researcher at Carnegie Mellon University in Pittsburgh. "What made Ethernet successful, for example, was not that it was fast or easy or extremely pleasant to work with, but [rather] it was everywhere."

Bershad adds that without carrier commitment to services, it will be tough for users to justify ATM equipment purchases.

A big mistake?

Carriers have been quiet on ATM for a variety of reasons, according to industry experts. For one thing, says Tom Nolle, president of CIMI Corp., a consultancy in Voorhees, N.J., carriers are afraid of making a major mistake.

"Some [carriers] don't think they can cost-justify ATM today, while others believe there is no credibility to widespread ATM use," he says. "Some are looking beyond the allure of the technology to the business case and wondering why, if T-3 providers have been starving to death, things would be any different for them."

Nolle also notes that once carriers announce ATM services, they'll be hard-pressed to push offerings such as frame relay and Switched Multimegabit Data Service (SDMS). "Until these issues are worked out, any carrier who brings out a service will risk laying a major egg," he says.

An AT&T spokeswoman would not say why the carrier has not yet outlined its ATM strategy, but she claims AT&T will begin making its plans clearer this week in the first of several planned announcements. "We are moving very aggressively toward ATM," she says. "1993 will be a very exciting year for AT&T and ATM."

AT&T Network Systems last week confirmed it will announce this week an ATM switch that can be used in private nets and by carriers to provision ATM services.

MCI's plans aren't any clearer. Paul Weichselbaum, vice-president of data product marketing for MCI, says the carrier "does not have answers to questions about deployment and pricing."

MCI has installed Siemens AG ATM switches in its net that can be used to offer frame relay and SMDS, which are both based on cell switching, in addition to ATM services. While the switches needed to support ATM are in place, the carrier would have to spend millions to support ATM services, Weichselbaum says. And MCI would like to get a handle on demand before initiating trials and deploying service.

Thus, MCI isn't saying if it plans to offer ATM services anytime soon. "We like to lead the market, but we don't want to get out in front of it," Weichselbaum says.

One potential ATM user, who requested anonymity, says, "How can users decide what's best for them in the wide area if there's nothing to choose from? It's the open systems problem all over again. The vendors are saying they're not developing anything because users are not buying. They're not buying because there's nothing out there."

Of the Big Three, Sprint has done the best job in detailing its ATM deployment strategy.

As part of a five-year, $50 million contract, Sprint will begin offering ATM service at T-3 speeds to the Department of Energy by midyear, with general commercial availability through more than 300 U.S. points of presence starting in the fourth quarter.

Greg Crosby, Sprint's director of ATM and broadband services marketing, says the carrier has been testing TRW, Inc. ATM switches, Cisco Systems, Inc. routers and other ATM net elements at its Burlingame, Calif., labs and the products "have passed with flying colors.

"We could offer ATM sooner if trials and betas go well," Crosby says. "But we couldn't do that based on two, three or four accounts. We'd have to have enough justifiable business."

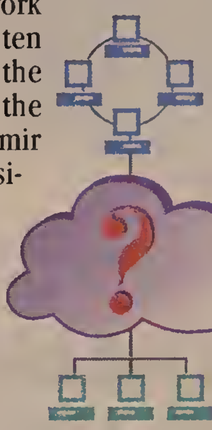
A local issue

Local carriers seem to have grand plans for ATM based on a spending study from Gartner Group, Inc., a Stamford, Conn., consulting and research firm (see Figure 1, this page). But local service providers aren't trumpeting their plans to users. Only one RBHC — Nynex — has even partially detailed its ATM vision.

Nynex is targeting late this year or early 1994 for a commercial offering of cell relay services, which will be based on standards set by the ATM Forum, but has not yet decided how widely it will deploy services or what it will charge. "It's premature to discuss those aspects," says Bill Bjorkman, staff director of broadband planning for the Nynex companies.

Nynex last week selected Fujitsu Network Switching of America, Inc.'s FETEX-150 broadband switch for use in the company's upcoming field trial. Nynex will use the Fujitsu switch to send data at high speeds among a variety of locations using fast packet services, including frame relay, SMDS and cell relay. If the field trial is successful, Nynex will begin deploying the switches.

"Bringing ATM technology to the heart of the network positions Nynex to hasten the development of the broadband era in the Northeast," says Casimir Skrzypczak, vice-president of technology and network planning for the Nynex telephone companies.



According to Marty Tanner, a product development manager with Southwestern Bell Corp., the RBHC is still working on its ATM strategy and will make it public by midyear. "Services will follow, but we're not sure when," he says. "We're still conducting ATM lab and field trials."

Tanner says the carrier has used ATM internally to reduce costs. "We see clear revenue opportunities," he says.

Yuet Lee, executive director of broadband strategy and product development for Pacific Bell, says the company has not yet decided from which vendor's ATM platform it will deliver ATM, let alone a deployment plan or pricing strategy.

However, Lee says Pacific Bell would likely file a general tariff for ATM services sometime in 1995. The company is testing ATM switches in its labs from vendors he would not name.

Similarly, Will Walling, manager of broadband services for US West, Inc.'s Advanced Communications Services unit, acknowledges that the carrier hasn't decided on deployment or pricing. US West is currently testing the FETEX-150 switch, along with switches made by AT&T Network Systems and Siemens, as part of its Communications Programs for Advanced Switched Services broadband networking field trial.

Walling did say, however, that US West will deploy small ATM switches close to users rather than charging for dedicated access to a handful of large, centrally located switches.

"In the long run, this approach reduces users' dedicated access, which makes ATM much more attractive," he says.

What ATM will cost

Figure2

Device	Per-connection cost
Work group hub	$7,000-$8,000
Campus hub	
Light load	$10,000-$12,000
Heavy load	$8,000-$10,000
WAN backbone/carrier concentrator	
T-1 port	$3,000-$5,000
T-3 port	$4,000-$6,000
Optical Carrier-3 port	$6,000-$8,000
CO switch with T-3 line	
Light load	$5,000-$6,000
Heavy load	$3,500-$5,000

A connection includes the cost of an adapter card and the prorated per-port switch cost. For public net products, a DSU/CSU is used instead of the adapter card.

SOURCE GARTNER GROUP, INC., STAMFORD, CONN

Other factors

What services and when they will be available is only one issue. Carrier pricing strategies could also make or break ATM WANs.

"The carriers have been mum about ATM because they haven't come to terms with pricing," says Chris Oliver, director of manufacturing and engineering at Cabletron Systems, Inc. "Until they understand how to provide it at a price people will be willing to pay, they will be hesitant to claim they can offer it because of fear of backlash."

Although the carriers have yet to release even preliminary pricing ranges for ATM services, users can expect a significant increase in their monthly line costs if they embrace ATM, he explains.

"If you scale up today's pricing for leased lines and factor in some kind of quantity discount, you're still talking some serious numbers," Oliver says. "A 10-to-1 cost increase when going from 1.5M to 155M bit/sec — a hundredfold increase in speed — is not unreasonable to assume. If you're paying $5,000 a month for a T-1 line, you're probably looking at around $50,000 a month for ATM."

While carriers don't have any firm pricing plans, those interviewed for this story say they would first charge a flat monthly rate — largely because it's easier and doesn't require billing system changes. Some say they would later give customers the option of usage-based pricing or usage billing with a cap.

Carrier product managers generally agree that ATM at T-3 must cost less than dedicated T-3 links but would not hazard a guess on how much.

Cost-justification of an ATM service may be more important than the actual pricing.

"The principal thing hurting the development of ATM carrier services today is the utter lack of benefit sufficient to justify the cost," CIMI's Nolle says.

"The threshold for ATM, according to the present standards, is 45M bit/sec," he says. "User access to any net service at that speed is going to cost an average of $6,200 a month, which is about five times what the average user says they are willing to spend on their most bandwidth-demanding data application — LAN interconnection." ◘

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Regulatory Update

As expected, the **Federal Communications Commission** has asked a federal appeals court to reconsider a ruling issued in November that overturned the FCC's policy of allowing nondominant carriers to operate without tariffs.

The FCC asked the U.S. Court of Appeals for the District of Columbia for a rehearing en banc, meaning all 11 appeals court judges would hear the case. The November ruling was issued by a three-judge panel of the court.

MCI Communications Corp. also asked the appeals court to rehear the case. MCI said the court's decision to overturn such long-standing rules could seriously disrupt the industry. "The [court] ruling undermines thousands of contracts between nondominant carriers and their customers . . . and casts doubt on the mutual obligations of carriers and their customers under those contracts," MCI told the court.

The court's ruling overturning the FCC rules will not take effect until the court decides whether to allow a rehearing.

Ireland, Finland added to AT&T's Global SDN roster

Third carrier in Japan is also offering service.

By Bob Wallace
Senior Editor

BASKING RIDGE, N.J. — AT&T last week started offering its Global Software-Defined Network service in Finland and Ireland, bringing the number of countries where the service is available to 16.

Introduced in 1989, Global SDN enables users to create uniform seven-digit dialing plans for firms with sites in the U.S. and other countries. Global SDN is economical for firms that have two or more hours a day of on-network traffic. Users save an average of 30% off International Direct Distance Dialing (IDDD) rates, AT&T said.

Global SDN also offers fast call set-up times and alternative access, a feature that enables employees — especially travelers and those that make calls from home — to place a Global SDN call via an 800 number assigned to their company.

AT&T has extended Global SDN to firms with sites served by Telecom Finland and Telecom Ireland, and with International Telecom Japan in Japan. AT&T already offers Global SDN in Japan through Kokusai Denshin Denwa Co. and International Digital Communications, Inc.

"With these new countries, we have critical mass in Global SDN deployment for our U.S.-based customers," said Doug Macbeth, director of product management with AT&T's Business Communications Services unit.

Significant savings

The Global SDN rate for calls from the U.S. to Finland during peak calling is $3.15 for a 4½-minute call (the average length of an international business call) compared to $6.78 under AT&T IDDD rates — a savings of 53%. The rate for using Global SDN from the U.S. to Ireland is also $3.15, compared to the AT&T IDDD rate of $5.79 for the same length call, a savings of 46%.

Global SDN carries calls from sites in the U.S. to locations in Brazil, France, Italy, Japan, Norway, Singapore, Spain, Sweden and the U.K. It is also available in Australia, Belgium, Canada, Hong Kong and the Netherlands.

MFS extends its Boston fiber net

By Bob Wallace
Senior Editor

BOSTON — Metropolitan Fiber Systems (MFS)/McCourt, Inc. last week said it has acquired Boston Fiber Optic Co.'s network, a move that is part of a plan to quadruple the size of its all-fiber net here.

MFS/McCourt said the acquisition of Boston Fiber Optic's net and its own expansion plan will add 72 route miles to its existing 18. The expanded network will offer access to voice and data services to users in more than 350 buildings along the route, said Royce Holland, president of MFS, Inc. of Oakbrook Terrace, Ill. — MFS McCourt's parent company.

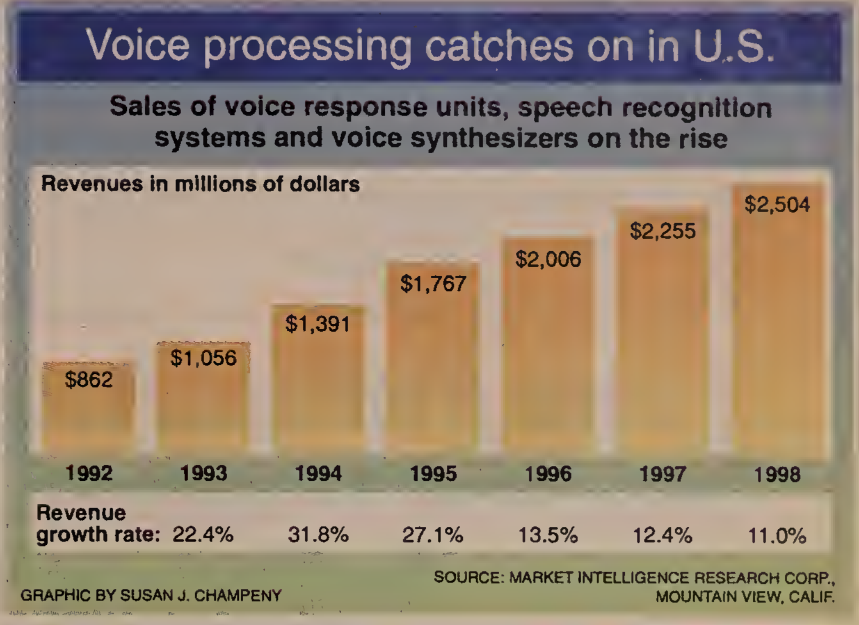
The Boston Fiber Optic's network is approximately 10 route miles in length and serves 20 buildings in downtown Boston and Cambridge, as well as the Back Bay and Beacon Hill areas.

MFS/McCourt's expansion will extend its fiber network from the downtown area to reach users in suburban business centers north and west of here.

"Boston is recognized for the number of data-intensive financial and high-tech organizations within its metropolitan area," Holland said. "The acquisition is important because it gives MFS/McCourt immediate access to the Cambridge market and increases our customer base."

Expansion of the MFS/McCourt network will enable the carrier to provide local private-line services and special access services, and will include access to several New England Telephone and Telegraph Co. central offices.

Also, the network will give users access to MFS' High-speed LAN Interconnection services, which are scheduled to be available here by the end of March.



Voice processing catches on in U.S.

Sales of voice response units, speech recognition systems and voice synthesizers on the rise

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: MARKET INTELLIGENCE RESEARCH CORP., MOUNTAIN VIEW, CALIF.

RBHC puts SS7, AIN investment to use

Bell Atlantic uses technology to customize new local net services for customers on demand.

By Daniel Briere
Contributing Editor

Bell Atlantic Corp. has begun to make use of its massive investment in Signaling System 7 (SS7) and new Advanced Intelligent Network (AIN) software by creating new services for customers on demand.

In recent months, the regional Bell holding company has seen heavy interest from end users looking to make the embedded telecommunications net solve their networking problems.

"We just created a custom solution for a customer who wanted to be able to turn on and off a bank of phones at his facilities for a customer-defined period measured in minutes," said Von McConnell, manager of AIN service creation at Bell Atlantic.

The customer, which Bell Atlantic declined to name, wanted to make telephones available free of charge to a select group of users during customer-sponsored events. The phones are only activated for a specific period during these events.

Using Bell Atlantic's AIN capabilities, the client can use any phone keypad to activate and deactivate a series of telephone lines and have the usage fees billed back to his account.

"We even allow the client to give authorization codes to his users if he wants so he can differentiate valid and invalid customer calls," McConnell said.

This is made possible by the service creation environment of SPACE, Bell Communications Research's name for its advanced intelligent network architecture. "The only way we could create new telephone services in the past was to order new services from the manufacturer of the central office switch," McConnell said. "In many cases, that could take several years. Now, with AIN, services are mere customizable, graphically displayed software entities."

Most RBHCs and local exchange carriers are currently moving forward with AIN laboratory testing and development, with the ultimate goal of implementing Release 1.0 capabilities, which brings full-switch functionality under the control of external AIN databases.

Under Bell Atlantic's AIN implementation of SPACE, the service logic of a call is housed in a centralized database, dubbed the Integrated Service Control Point (ISCP). Individual switches use SS7 to query the ISCP for instructions and supplemental information.

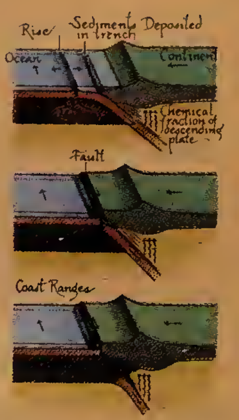
Today, Bell Atlantic estimates that 80% of its business population has access to AIN service, which requires SS7. The carrier had deployed SS7 to more than 96% of its access lines by the end of 1992.

However, McConnell did acknowledge that there were some locations where AIN would not be

(continued on page 92)

Not long ago, identical fossil types were discovered in South America and Africa. A rather curious unearthing, given that the two continents are noted today for their uniquely different species. To explain this finding, the naturalist Alfred Wegener correctly proposed the idea that long before our knuckle dragging ancestors made their foray onto the planet, Earth's continents had once been a single land mass that later split apart. What we are referring to, of course, is the theory of continental drift.

Although this most fantastic of Earth's mysteries may cause alarm for some people, it doesn't trouble us in the least. Because no matter how far apart the continents may drift, N.E.T.'s enterprise networks will make certain that they all stay connected. Easily, quickly and transparently.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While many set out to change the world, the real movers and shakers are the tectonic plates.

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OUR PLAN TO REUNITE THE CONTINENTS.

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Furthermore, it gives you the power to connect high performance workgroup data networks today and the ability to add multimedia applications as you need them. That this technological accomplishment originates from N.E.T. should come as no surprise. After all, ATMX has an impressive genealogy. From the broadband, high speed networks of our STM, to the global communication capabilities of IDNX, to the internetworking capabilities of our enterprise routers and frame relay modules. Not to mention the access networking capabilities you get from our ADNX and SPX products.

We're tearing down the boundaries between LANs and WANs. Now you can connect desktop to desktop down the hall, and around the globe.

Millions of years ago, the continents were in a single mass called Pangaea. It eventually split and formed two smaller masses, Gondwanaland and Laurasia. Further splitting brought the continents to their present position. And you thought people had a hard time staying together.

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WHAT GOES AROUND COMES AROUND.

It seems that networking products bridging great distances may not be required 250 million years from now.

Scientists tell us that if present movements continue, the Atlantic and Indian Oceans will close up, drawing the continents together in a single immense land mass. Fascinating. But frankly, who can wait that long?

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ENTERPRISE APPLICATIONS

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Worth Noting

"Over 75% of today's corporate E-mail users are still mainframe- and minicomputer-based, but each year, approximately a quarter of this population shifts to PC-based mail systems.

David Ferris
President
Ferris Networks
San Francisco

Store & Forward

Burlington, Mass.-based **Ontos, Inc.** recently shipped an object-oriented tool kit for developing network-based multimedia applications.

The Distributed Multimedia Platform lets developers build multimedia applications that run on Novell, Inc. NetWare local-area networks supporting OS/2 servers and DOS clients. The tool kit includes a multimedia class library, Ontos' object-oriented database, an application program interface written in C language and an interface to IBM hosts.

Ontos, an IBM Multimedia Business Partner, is pricing the tool kit under $5,000, not including the Ontos database.

Beyond, Inc. of Cambridge, Mass., recently announced that its messaging system, BeyondMail, has been integrated with two group scheduling products: OnTime from Campbell Services, Inc. and CaLANdar from Microsystems Software, Inc. Both schedulers' address books are integrated with BeyondMail's directory, which serves as the transport engine for handling calendar updates.

(continued on page 92)

Lotus unveils cc:Mail for remote Macintosh users

Lets users communicate on various platforms.

By Timothy O'Brien
West Coast Bureau Chief

SAN FRANCISCO — Building on its multiplatform electronic mail strategy, Lotus last week announced a new version of its cc:Mail program designed for remote users of Apple Computer, Inc. Macintoshes.

CC:Mail Remote for Macintosh Version 2.0 allows remote users of Apple's Macintosh or PowerBook computers to communicate with cc:Mail users on a range of platforms, including DOS, Windows, OS/2 and Unix, as well as other Macintosh systems.

Apple and Lotus hailed the remote Macintosh software as a boon for the several hundred thousand PowerBook users and the millions of Macintosh users who share messages or data with all types of office computers. Lotus claims it already has a large back-order for the product.

CC:Mail Remote is based on the local-area net version of cc:Mail for Macintosh 2.0, a major revision of the Macintosh cc:Mail product released last summer that provides tighter integration with other platforms. The LAN and remote versions look and operate identically.

As a result, cc:Mail Remote users can send and receive messages containing graphics, file attachments, sound and facsimilies to any other cc:Mail user, even if they employ other cc:Mail versions on different operating systems. This is possible because all cc:Mail versions now support a common back-end architecture, giving cc:Mail clients full access to the cc:Mail directory database.

To communicate with cc:Mail users on a LAN, the new cc:Mail Remote software supports dial-in to a dedicated personal computer on the LAN running cc:Mail Router software. The router software can support as many as eight simultaneous incoming calls.

The software works similarly for remote users wanting to communicate with a local machine that is not on a LAN. CC:Mail provides software in the stand-alone desktop version that allows remote users to send and receive messages using the batch mode facility.

CC:Mail Remote 2.0 is available now for $295 per workstation and will run on all Macintoshes running operating systems ranging from System 6.0.7 through System 7. ◘

New firm to focus on groupware

By Timothy O'Brien
West Coast Bureau Chief

Powercore, Inc., a maker of time management software, said last week it will merge with Finansa, Ltd., a U.K.-based messaging company, to form an independent firm committed to providing groupware products.

The two privately held companies are forming Powercore International, which will have combined revenue of about $10 million, through a stock swap.

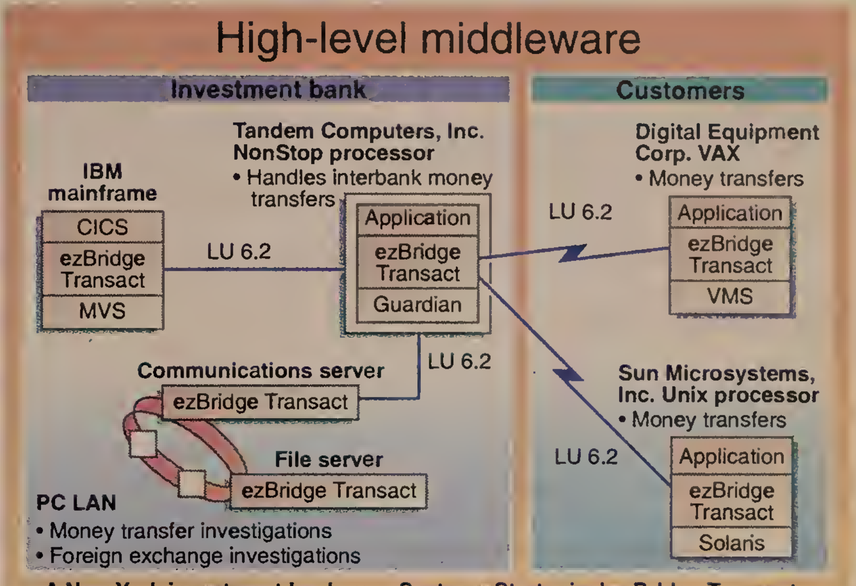
According to market research firm International Data Corp. in Framingham, Mass., Powercore holds 61% of the work group scheduling market with its multiplatform Network Scheduler 3 product. Running on DOS, Apple Computer, Inc.'s Macintosh and Microsoft Corp.'s Windows machines, Network Scheduler 3 boasts over 1 million users. A single-user version of the program, called TimeVision, is also available.

Finansa has gained growing recognition for its WinMail product, which is a Windows- and DOS-based electronic mail package for Novell, Inc. NetWare networks.

In addition to offering these existing products, the new company plans to develop an integrated set of collaborative office products that include group scheduling, messaging and contact management.

"We are merging the fastest growing messaging company in Europe with Powercore, the leader in work group scheduling, to develop and market open, collaborative solutions," said Carl Melville, director of marketing at Powercore. ◘

High-level middleware



A New York investment bank runs Systems Strategies' ezBridge Transact middleware on diverse platforms at their offices and customer sites to integrate distributed applications.

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: SYSTEMS STRATEGIES, INC., NEW YORK

Middleware company broadens its appeal

Firm adds support for IBM's MQI, more protocols to make ezBridge Transact more attractive.

By Wayne Eckerson
Senior Editor

NEW YORK — To Systems Strategies, Inc., the scores of vendors now announcing middleware products are Johnny-come-latelies.

Based in midtown Manhattan, Systems Strategies four years ago developed a message-based middleware product called ezBridge Transact to meet the distributed transaction processing needs of leading New York financial institutions.

The middleware product appeals to financial firms because it guarantees message delivery between applications running on multiple networks and computing platforms, said Sam Somech, director of research and development at Systems Strategies. For example, banks use ezBridge Transact to support credit/debit transactions, such as those carried out at automated teller machines, and brokerage houses use it to deliver buy and sell orders to stock exchange floors.

More than a dozen banks and brokerage houses have deployed ezBridge Transact, as well as several retail and manufacturing firms. While ezBridge Transact's earliest successes have been in the financial industry, Somech said the product would appeal to any firm needing to integrate applications running on heterogeneous platforms across an enterprise network.

Currently, ezBridge Transact runs on almost a dozen platforms, including IBM MVS/CICS mainframes and Application System/400 minicomputers, Digital Equipment Corp. VAX/VMS processors, Tandem Computers, Inc. NonStop processors, Sun Microsystems, Inc. SPARCstations and DOS, Windows and OS/2 personal computers or local-area net servers. It supports LU 6.2, DECnet and X.25 communications protocols and will add support for Transmission Control Protocol/Internet Protocol this year.

How it works

Like most middleware, ezBridge Transact supports a simple application program interface (API) that shields developers from the complexities of the underlying network. The API, which is almost identical on all platforms, allows users to integrate new applications with legacy applications on different platforms without having to write peer-to-peer interfaces for each program, said Les Yeamans, vice-president of Systems Strategies' ezBridge Transact division.

The product delivers transactions or updates between applications in the form of messages. It logs these messages to recoverable queues on a hard disk before delivering them to the user. If there is a network or other failure, ezBridge Transact resends

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Middleware company broadens its appeal

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the message, ensuring that a transaction or update is successfully completed.

Users have the choice of sending messages in synchronous or asynchronous fashion, depending on the nature of the transaction.

In synchronous messaging, an application waits for a response from the receiving application before sending another message. In asynchronous messaging, an application can send messages one after another without waiting for a response from the other end.

Somech said most complex business transactions, such as executing a stock trade, comprise numerous subtransactions that require different messaging modes.

With ezBridge Transact, users employ the most appropriate message mode for each step within a complex transaction. Its use of recoverable message queues assures delivery of all messages and updates if a network or system failure occurs during the middle of a transaction, he added.

What's new for '93

Systems Strategies is making several moves to broaden the appeal and market scope of ezBridge Transact. Last month, it announced an alliance with IBM to build middleware products that incorporate IBM's Message Queue Interface (MQI) ("Systems Strategies helps IBM fulfill blueprint plan," *NW*, Dec. 7, 1992). MQI is an API that is specified in IBM's Network Blueprint strategy for linking distributed applications in a heterogeneous network and computing environment.

In 1993, Systems Strategies will announce MQI interfaces for most of the platforms currently supported by ezBridge Transact, Yeamans said. In addition, it is working with IBM to ensure that MQI-based products developed by the two companies are interoperable. To do that, the companies are developing a new internal communications protocol that will replace ezBridge Transact's proprietary Message Link Protocol.

Yeamans said he expects that most ezBridge Transact customers will upgrade from the ezBridge Transact API to IBM's MQI because MQI is part of IBM's Network Blueprint and has the backing and financial resources of IBM behind it.

Yeamans also said IBM and Systems Strategies would develop message-based technology that uses memory-based queues instead of disk-based queues to speed application performance. These memory-based queues would be used for applications in which reliability is not critical, such as database inquiries. Messages stored in memory-based queues are lost when a system fails or shuts down.

Also this year, Systems Strategies plans to announce relationships with several transaction monitor vendors to ensure interoperability between ezBridge Transact and message queues built into their products. Systems Strategies expects to announce such relationships with Transarc Corp. and Unix System Laboratories, Inc., both of which make Unix-based transaction monitors.

Store & Forward

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Oracle Corp. last week began shipping a production version of Oracle7 Cooperative Server database management system for Digital Equipment Corp. VAX minicomputers running the Open VMS operating system.

The new version, which costs $3,200 with optional modules for distributed support and other features, is the first production platform on which Oracle7 has been made generally available.

Keyfile Corp. of Nashua, N.H., last week said Version 2.1 of its Keyfile document management software will support Microsoft Corp.'s Object Linking and Embedding (OLE). This will let users document- and image-enable Windows applications and let them embed OLE objects, such as voice and video annotations, into Keyfile documents. Available in March, 2.1 ranges in price from $595 for a single user to $995 per user for an unlimited amount.

Solomon Software of Findlay, Ohio, has announced Windows-based accounting software that works with SQL databases. Solomon for Windows, which consists of 10 accounting modules, is geared toward firms with $1 million to $100 million in annual revenue. The general ledger module costs $795 for five users and $5,995 for 100 users, with similar pricing for other modules. Discounts are available for users upgrading from Solomon III.

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RBHC puts SS7, AIN investment to use

continued from page 89

available soon due to switch problems, notably areas served by DMS-100s and AT&T 1AESS switches.

Today, Bell Atlantic remains the first RBHC to have implemented AIN Release 0.0 technology in its embedded net and is the first to offer tariffed services over that platform. It also has AIN tariffs filed for Centrex Extend and Switched Redirect.

Centrex Extend allows company offices located in different cities to call each other using extension dialing over public or private facilities. Its Work-at-Home feature allows users to make and receive calls just as though they were in their office.

Switch Redirect allows a firm to instantly reroute thousands of incoming calls to preselected locations in the event of a flood, fire or other emergency. Managers simply use their keypad to program routing choices.

Bell Atlantic has been pleasantly surprised at the early response for AIN services by customers. "Users have been innovative in their requests for custom services," McConnell said.

One popular service that has been requested, and one that is under consideration for tariffing, addresses users affected by an area code change. Many users wanted specific announcements stating that their number has been changed, giving their new number and then directing the call to the new number.

"That is technically possible in our system today," McConnell said. "The only question for us is how to tariff it."

Another hot topic is local call detail report analysis. "We've never had the capability to record calling activities in a customized manner within the network in real time," he said. "We've put in a Data and Report System as part of the AIN platform to track calling patterns upon customer request so that customers could get geographic reporting on their traffic."

It is even possible to marry this information with existing nonproprietary vendor demographics or other data to get more detailed analysis. "Our big limitation is the regulations — privacy and such," McConnell said.

Bell Atlantic hopes to roll out network-based automatic call distribution (ACD) based on the AIN platform, too. This would free customers from maintaining multiple premises-based ACDs in a multisite network by centralizing the data in the AIN distributed processing databases.

The network ACD might be located behind an Area Number Calling service, so a firm can publish a single number and have incoming calls routed automatically to specific locations or have the incoming party manually determine the terminating location. A tariff on that might be seen sometime this year. "We can do it on an individual case basis today," he said.

In designing custom net services, end users will find that dealing with the technology in the network will not be as big of a hurdle as the billing and regulatory issues. "We built one application for a customer in one hour — a complex one at that — and then we called the billing people who said, 'Call us in a year,' " McConnell said.

However, more often than not, there are ways around these problems. "In that case, we worked with the billing people and found a way to make it work," he said. "It just took a little longer than an hour."

The regulatory status can also be a problem. "Right now, many of these systems are being installed on an individual case basis," McConnell said, noting that they were being installed in mostly large customer applications. "Once someone else asks for the same service, we have to tariff it, which takes time."

Bell Atlantic continues to take direction from users. "We gave up on prototyping," he said. "Everyone wants something different. But these types of services are the future for us. It's going to turn the tables to where user priorities, not switch vendor schedules, determine what services are deployed and when."

Briere is president of TeleChoice, Inc., a Montclair, N.J., consultancy.

INDUSTRY UPDATE

VENDOR STRATEGIES, MARKET TRENDS, ALLIANCES AND FINANCIALS

Worth Noting

According to Apple Computer, Inc.'s 1992 annual report, the company spent $602 million on research and development last year, accounting for 8.5% of sales. The company also noted in the report that it plans to release new network management, remote access and server products this year.

People & Positions

David King, previously vice-president of marketing at Vitalink Communications Corp., last week was named vice-president of marketing and acting chief financial officer at **Proxim, Inc.** of Mountain View, Calif.

Andy Grace has been named vice-president of international sales at **FastComm Communications Corp.**, a Sterling, Va., vendor of frame relay and other data communications equipment. He will be responsible for establishing international distribution, OEM and reseller channels outside the U.S. Previously, Grace was responsible for development of U.S. and international distribution channels at Teleos Communications, Inc.

Optical Data Systems, Inc., a Richardson, Texas, local-area network product vendor, has named **Joe Tucker**, formerly vice-president of Datapoint Corp., as vice-president of North American sales. Tucker will head the sales operations for Fiber Distributed Data Interface, Ethernet and token-ring products.

Users, industry urge NIST to reaffirm status of DES

Gov't. encryption algorithm up for 5-year review.

By Ellen Messmer
Senior Correspondent

WASHINGTON, D.C. — Both users and industry are urging the National Institute of Standards and Technology (NIST) to retain the Data Encryption Standard (DES) as the approved algorithm for private-key encryption.

NIST, which for more than a decade has used DES as the government encryption standard for unclassified purposes, last September began a review of the algorithm to determine whether to reaffirm its standard status for the next five years.

In public comments released last week, users and suppliers said the DES encryption algorithm has not been cracked and warned that dropping it as an approved standard would create economic hardship.

Government agencies must use DES for sensitive, unclassified data. Outside of the government, the banking industry regards DES as the preferred private-key encryption algorithm since it is government-approved.

In its comments to NIST, Racal-Guardata, Inc., a maker of encryption products, said banking and government users have finally started using DES-based cryptography products in sufficient volumes to drive down unit prices below $800.

"A decision now to obsolete DES in the next several years will deal a major blow to the progress that has been achieved," said Samuel Epstein, president of Racal-Guardata.

DES a popular choice

Other vendors, including AT&T, Cylink Corp., IBM, Microsoft Corp. and Xerox Corp., also advised NIST to reconfirm DES. They suggested that NIST expand its approval of DES in the future, sanctioning its use in software as well as hardware.

Users also called for a software-based DES version to be approved. "We feel substantial cost avoidance could be realized if this were brought about," said Reed Phillips, director of information resources management at the U.S. Department of Commerce.

Phillips noted that the Census Bureau is planning a project requiring DES protection. "Within the next five years, they will have 3,000 notebook-type computers throughout the country, transmitting data to a central computer over dial-up lines," he said. "Hardware implementation of DES would become expensive to procure and install. Through software implementation, the potential savings could reach $500,000."

Other users that voiced support for DES included the Nuclear Regulatory Commission, the Department of the Interior, the Department of Justice and the First National Bank of Omaha. The X9 Accredited Standards Committee and the trade groups Information Technology Association of America (ITAA) and the Computer and Business Equipment Manufacturers Association also lined up behind DES.

More muscle

Michael DeFazio, chairman of the ITAA computer and network security committee, said the association members would not object if NIST proposed a procedure to strengthen DES by lengthening the current 56-bit modulus.

"In such a way, the industry investment made in good faith upon the 15-year standard would not be undercut, while at the same time, [it would raise] the cost to a potential intruder," he said.

Microsoft also recommended strengthening DES. "While DES is probably still secure, it is aging," said Karen Hargrove, general manager of digital communications in Microsoft's advanced technology and business development division. "Advances in computing power and increasingly sophisticated attacks place it at risk. NIST should investigate other schemes for strengthening the system, including triple encryption and use of longer keys."

NIST plans to issue its policy recommendation on DES in about a month, but sources there said the final decision on DES rests in the hands of the new administration's choice for secretary of commerce. Democratic Party Chairman Ron Brown, the Clinton administration's nominee, still faces Senate approval.

Fore Systems, Inc. mini-profile

Founded:	April 1990 by a quartet of Carnegie Mellon University researchers
Based:	Pittsburgh
Estimated 1992 revenue:	$4.5 million
Primary business:	Development and sale of Asynchronous Transfer Mode switches and adapter cards
Customers:	50 organizations, including AT&T, Bear, Stearns & Company, Inc., Digital Equipment Corp., Naval Research Labs and Stanford University
Business partner:	Cabletron Systems, Inc.

FORE SYSTEMS

GRAPHIC BY TERRI MITCHELL

Fore Systems meets '93 with momentum

Start-up posts impressive financials for ATM switches; suitors line up for possible ventures.

By Bob Brown
Senior Editor

PITTSBURGH — Fore Systems, Inc. last week completed a $5 million initial round of venture financing that will help it in its quest for leadership in the emerging Asynchronous Transfer Mode (ATM) market.

The venture capital will be used to expand manufacturing facilities, augment service and sales staffs, and support product development. The financing was provided by an investment group including Patricof & Company Ventures in New York and Battery Ventures L.P. in Boston.

Mark Juliano

Fore, which began shipping its ForeRunner ATM private network switches in July, rang up revenue of about $4.5 million in 1992, said Mark Juliano, Fore's director of product marketing. The company installed 70 switches and 400 adapter cards at a variety of user sites but mostly in research and engineering settings, he said.

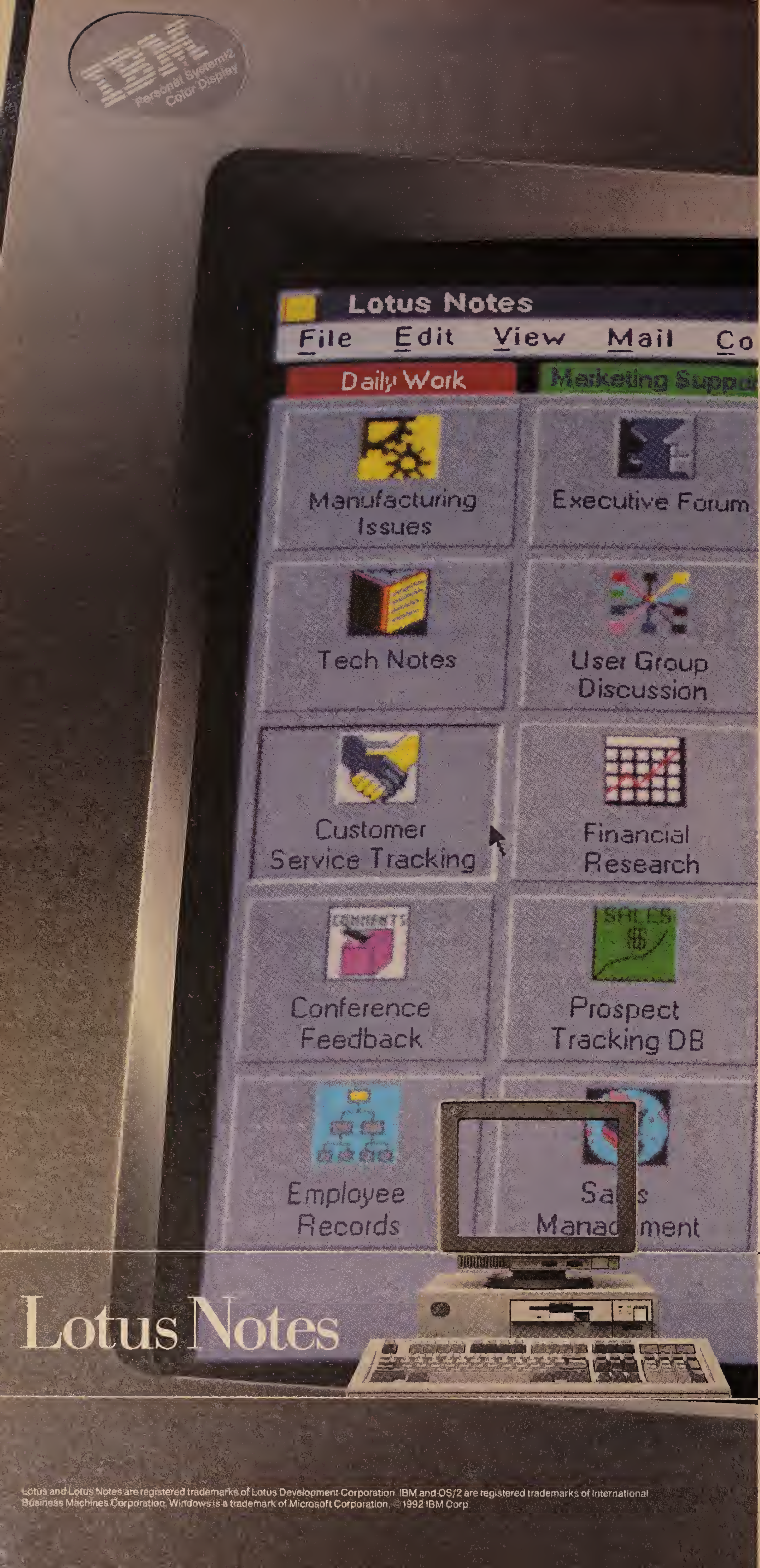
Those impressive numbers were key in attracting venture funding, and they have caught the eye of other network suppliers hoping to partner with Fore to add ATM capabilities to their products, Juliano said. Fore has been approached by about 15 vendors, including makers of hubs, routers, multiplexers and data service unit/channel service units, he said.

To date, Fore has only established a formal accord with Cabletron Systems, Inc., which has agreed to integrate its hub and management system with Fore's products and resell Fore's product line. But Fore is open to other deals, Juliano said.

"We're looking for partnerships, not just for us to be the design arm and the other company to be the sales arm," he said.

Meanwhile, Fore has a busy product schedule set for 1993: The company plans a new high-speed switch; a T-3 interface for its ForeRunner ASX-100 ATM LAN Switch; and new adapter cards for IBM RISC System/6000 workstations and personal computer platforms yet to be decided upon by the company.

"Fore is about the first surfer on the wave, and if it turns out to be a big wave, the company should have a hell of a ride," said Todd Dagres, director of data communications research at The Yankee Group in Boston. Dagres said he would not be surprised to see Fore sign on an industry insider to a top post to help the firm grow beyond "the concept stage to a market winner."



Lotus Notes

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Worth Noting

"Moving to a help desk makes sense. It's a trade-off where instead of having a person who's earning $45,000 a year talking on the phone two hours a day, you have a person who's only earning $20,000 taking the calls."

Mark Trisko
Manager
Customer assistance center
Blue Cross and Blue Shield
of Minnesota
Eagan, Minn.

Manager Minutes

The Association for Information Technologies (AIT) is sponsoring an educational symposium titled "Network Management, Interconnectivity and Security" Feb. 10-11 in New York.

Planned sessions include a primer on the state of networking today, a look at network management and an exploration of interconnectivity management and security issues at the physical level.

For additional information, contact AIT at (516) 269-6713.

The National Automated Clearing House Association and the **Treasury Management Association** are sponsoring the 1993 Financial EDI Conference to be held this week in San Antonio, Texas.

The conference will feature panels of financial electronic data interchange experts as well as hands-on demonstrations of EDI and electronic funds transfer programs..

For more information, call (301) 309-9404.

Top issues facing IS managers

407 IS managers list the top 5 issues they will face this year, along with the ranking for each in the last 4 years.

'93	'92	'91	'90	'89
1. Reengineering business processes using information technology.	2	1	1	11
2. Aligning information systems and corporate goals.	1	2	4	2
3. Improving the systems development process.	9	4	6	13
4. Instituting cross-functional systems.	6	3	3	7
5. Organizing and utilizing data.	4	5	7	6

GRAPHIC BY TERRI MITCHELL

SOURCE: CSC INDEX, CAMBRIDGE, MASS.

Survey finds IS managers turning to reengineering

Business process overhauls top '93 priority lists.

By Joanne Cummings
Senior Writer

CAMBRIDGE, Mass. — Information systems (IS) managers are tightening their network belts this year and earmarking their limited dollars for reengineering business processes rather than implementing new technologies, according to a study released last week.

CSC Index's sixth annual IS management study, called "Critical Issues of Information Systems Management," found that network budgets will register the lowest increase in five years, a mere 2.5% in North America and just 0.4% in Europe. This is down from increases of 3.5% in North America and 5.2% in Europe last year.

Respondents cited reengineering as their No. 1 priority this year, with nearly three-quarters currently undergoing major process improvement initiatives (see graphic, this page).

"For chief IS executives, 1993 begins where 1992 left off — with heightened demands from business managers to overhaul woefully inefficient business processes but with extremely stretched resources," concluded James Champy in the report. Champy is chairman and chief executive officer of CSC Index, a research firm here.

The study was based on responses from 407 top-level IS managers in North America and Europe who were polled about the greatest challenges they face in using and managing technology in 1993.

In addition to the push toward reengineering, the survey underscored the rapid rise of client/server computing. Nearly half, or 47% of the respondents, cited client/server as the emerging technology of greatest interest to them this year, a big jump from 26% last year. In addition, 39% of the North American respondents said they had already installed client/server technology.

According to CSC Index, the heavy interest in client/server and other technologies — such as imaging and computer-aided software engineering tools — signals that users are not venturing their dollars on unproven technologies. For example, pen-based computing and multimedia were much lower on the list of interesting applications.

In addition, client/server is popular because it is useful for reengineering projects.

"Client/server technology is the platform for many reengineered business processes, especially in customer service, where teamwork is crucial to resolving a customer's problem on the spot," said James McCauley, a senior partner in CSC Index's commercial systems integration practice.

Among other results, the survey found that the areas in which users are making the largest technology investments are customer service and order processing systems.

In addition, IS outsourcing continues to be an option for the organizations polled, with 49% saying they are planning to outsource some aspect of their IS functions this year, compared with 56% last year. In North America, the most often mentioned outsourced activity was disaster recovery, whereas in Europe, application development was cited most often.

The study is available for $20. For more information, call (617) 499-1888.

Analysts contemplate office of the future

Multimedia, videoconferencing to become norm in the high-bandwidth workplaces of tomorrow.

By Joanne Cummings
Senior Writer

Walk into any office today and, no matter what the business, you'll probably find networks optimized for handling such standard applications as electronic mail and file sharing.

But in the next five to 10 years, the standard office promises to support more bandwidth-intensive applications as technologies such as videoconferencing and multimedia become the norm, industry analysts say. In addition, many foresee the networks of tomorrow supporting speech-activated computer interfaces and wireless technologies.

In the end, the office of the future will be more efficient and everyday tasks will become less time-consuming, enabling workers to enjoy more leisure time, they say.

"Certainly, we'll see ubiquitous. compound documents that incorporate multimedia, such as adding voice and video to today's text and graphics," said Peter Kastner, vice-president at Aberdeen Group, Inc., a consultancy in Boston. "For example, if your boss just wants to say, 'I approve your memo, and I'm forwarding it upstairs for budgeting,' that's all your boss has got to do. Say it, and it goes."

Kastner said many of these applications will become possible due to the increasing processing power of local-area network-attached personal computers.

"By the end of the decade, I would expect that we would have some reasonably sophisticated speech recognition programs, if only by using the brute force of the MIPS we'll have," he said.

Others agree. According to Shaku Atre, president of Atre, Inc., a consultancy in Rye, N.Y., the technologies to watch are "wireless, multimedia and remote control."

Atre said the look of today's office will change to accommodate new technologies. "We will still use computers, but the size of the screen will get bigger and the CPU and hard disk will reduce [in size]," she said. "It will be just like a flat panel without a big structure behind it."

These new computers will be linked via high-bandwidth wireless technologies, Atre said, and users will interact with them via remote control and speech recognition.

"I will be able to start different sessions by saying things," she said. "Suppose I want to use a certain database. I will be able to say, 'customer database,' and it will be called up."

Atre said users in the office of the future will be able to handle virtually all business activities from their desktop computers.

As an example, she explained how, by using videoconferencing and multimedia applications, a user could call a travel agent, review videos of hotel accommodations and book a trip, all by just speaking to a computer.

The office of the future will be more efficient, enabling workers to enjoy more leisure time.

▲▲▲

"I should be able to just say 'Caracas,' and the computer will dial up a travel agency, interact with its database and bring up pictures of different hotels and their rates," she said. "And I should be able to make arrangements directly with the travel agent, interactively via the computer."

The same will be true of any other activities, she said, whether it be banking or dealing with customers and suppliers.

In addition, once these new applications become entrenched in the office environment, they should ease the work load considerably, Atre said. "I think we will be able to work faster, communicate faster, come to decisions faster jointly, and we won't have to travel so much," she said. "We'll be able to do things in half the time and maybe have much more free time."

OPINIONS

HIGH-SPEED NETWORKING

BY NATHAN MULLER

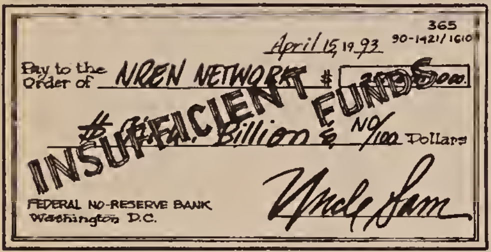
NREN raises false hopes for a better economy

On paper, the idea behind the National Research and Education Network (NREN) is commendable. Building the nationwide, multigigabit NREN would provide needed support for commercial, academic and government research projects that will give the U.S. potential competitive advantages.

But using public funds to build NREN will harm our economy, not help it. Conveniently ignored in any discussion of NREN is the fact that the U.S. is bankrupt.

In fact, any competitive advantages gained from a publicly funded NREN will quickly be dissipated by the faster accumulation of national debt, which has already left businesses starved for capital.

The national debt exceeds $4 trillion and continues to grow at a rate of almost $1 billion a day. Other federal debt, which is kept off the books due to political expediency, amounts to another $2 trillion to $3 trillion. The situation is no better in other areas of the economy. State and municipal governments owe $1 trillion, and consumer debt continues to hover at $1 trillion.



Some potential corrective measures include a mandatory federal balanced budget, drastic reductions in federal entitlements and foreign aid, streamlining the military, instituting big cutbacks in government staff at all levels and in all branches and, yes, higher taxes.

Sound scary? Then consider this: Even with these corrective measures, we will have only balanced the budget without making a dent in reducing the national debt, which will continue to balloon out of control as a result of the compounding interest. At current trends, we could have a national debt of $12 trillion to $13 trillion by the year 2000, with annual budget shortfalls approaching $1 trillion.

The economic problems facing our nation are so serious and run so deep that a growing number of economists and Wall Street analysts are beginning to say aloud what they had only whispered during this past election year — not only is the U.S. totally insolvent, but if our attitude toward deficit spending does not change fast, it will also be mathematically impossible to extricate ourselves from this mess. Then, by default, Japan and Europe will indeed eclipse us as the economic superpowers of the 21st century.

The bottom line is that NREN is a multibillion-dollar pork barrel project that relies on borrowed money. Consequently, instead of costing $3 billion, it will really cost $6 billion to $8 billion, depending on how fast the loans are repaid. While building and upgrading essential communications networks are of high national interest, letting the government add to our economic woes by borrowing more money is not.

The goal of NREN can best be achieved by government policies that encourage long-distance and local carriers, wireless networks, cable operators and information service providers to invest in rebuilding their network infrastructures. ◘

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EDITORIAL

Vendors: Let your user partners in on ATM plans

Vendors talk a lot about partnering with users.

If that's what they really want, then vendors owe it to users to lay out their strategies for supporting key technologies and standards. Users are trying to plan for the future, and they need to know whether and roughly when — if not exactly how — their key suppliers intend to support important emerging technologies.

NETWORK WORLD'S
R.A.F.
READER ADVOCACY FORCE

This week's Reader Advocacy Force (R.A.F.) story on Asynchronous Transfer Mode is a perfect case in point.

It's pretty clear at this point that ATM will have a dramatic impact on user networks in the years to come.

Many hub, router and other customer premises equipment vendors have taken pains to explain how their products will support ATM, and we applaud them for that.

But there is a wild card in ATM's future: carrier services.

Users don't have a good idea how local and long-distance carriers intend to deploy ATM equipment in their networks and what ATM-based services they're considering offering and along what timetable. Nor do they know how ATM service pricing will stack up against other services.

The carriers have been mum on the ATM service issue. Carriers say ATM is only just emerging and, given the lack of user demand, it's too early for services. But users are trying to determine how ATM will fit into their strategies. A solid wide-area service suite is crucial to ATM's success.

We're not asking carriers to preannounce services — though we'd love to hear from them if they choose to. But carriers should make clear how they view the adoption of ATM; otherwise, they risk slowing development of a technology that promises to solve tough user problems.

It's the right thing to do for their user partners. ◘

OPINIONS

FROM THE EDITOR

BY JOHN GALLANT

Forthcoming innovations will boost usefulness of publication

The new year is bringing some enhancements that are intended to make *Network World,* now in its eighth year of publication, even more useful to readers designing and managing enterprise networks.

First, we're improving our Buyer's Guides to provide more information to aid you in the tough technology purchase decisions you face today. In 1993, we'll run 25 Buyer's Guides that will feature a couple of new services: The Short List and FaxBack User Ratings.

The Short List will highlight a select group of products or services from our full Buyer's Guide listings that we urge you to examine.

Products and services recommended on The Short List meet the buying criteria we've established, which reflect the needs of users with multivendor enterprise networks, and, in some cases, offer additional useful features.

The Short List begins with this week's Buyer's Guide to software distribution tools (see page 98).

The FaxBack User Ratings will begin with our Buyer's Guide to intelligent wiring hubs in the March 8 issue. These ratings will reflect our readers' impressions of product quality, as well as service and support, among other things.

Network World has also joined forces with some leading authorities to conduct product testing under the *Network World* Test Alliance banner.

Test Alliance members will undertake real-world tests of internetworking systems, network software, security tools and other products that will be detailed in feature articles. Current members of the Test Alliance include Focus Software, Inc., Harvard University's Network Device Laboratory, the International Computer Security Association and TeleChoice, Inc.

The first Focus test of the Test Alliance, an examination of electronic mail interoperability, begins on page 1 this week.

Also, look for an expanded role for *Network World's* Reader Advocacy Force (R.A.F.) consumer advocacy initiative. In 1993, we'll have more R.A.F. stories spotlighting problems facing buyers of net products and services. Among our upcoming efforts will be the first annual *Network World*-Dataquest/Ledgeway survey of reader ratings concerning the service and support provided by vendors.

You can contact R.A.F. by calling (800) 622-1108, Ext. 487 or through our electronic bulletin board system (BBS). See page 2 for instructions.

In addition, a new advocacy feature dubbed the Network Help Desk will begin in February. Through this weekly column, readers will have their technical or managerial questions answered by experts, and we'll act as an ombudsman in resolving problems with vendors.

We're now inviting your input for the Network Help Desk. If you have questions or problems you'd like resolved, you can contact Susan Collins at (800) 622-1108, Ext. 413 or fax (508) 820-3467. You may also contact her through the BBS.

We are also welcoming some new regular contributors in 1993. Among them is Mark Miller, who joins *Network World* as a contributing editor. Miller, president of DigiNet Corp., a Broomfield, Colo., consultancy, will bring his background to bear on Buyer's Guides and feature articles.

Two new monthly columnists will also provide you with fresh insights on internetworking and the Internet. Scott Bradner, whose "Internetwork Monitor" column debuted last week, writes about the application and management of internetworking technologies for the Internetworks section.

Bradner is a consultant with Harvard University's Network Device Test Laboratory in Cambridge, Mass., and a popular speaker at such conferences as INTEROP. He also oversees the school's independent router tests.

Ed Krol, author of *The Whole Internet User's Guide & Catalog* (Sebastopol, Calif.: O'Reilly & Associates, Inc.), will appear in the Management Strategies section with a column designed to help readers navigate the Internet and make the most of its resources. Krol is a recognized authority on the Internet and author of *The Hitchhiker's Guide to the Internet.* His column begins Jan. 25.

Finally, you'll see some design modifications shortly. The basic editorial philosophy and structure of the publication won't change — you'll find our regular news, technical sections, features and opinions in their usual slots, and we'll continue our innovative use of graphics.

However, you'll notice a fresher, more flexible layout of all pages, improved type design and an enhanced Table of Contents, among other changes. The modifications, under the guidance of design expert Robert Lockwood, reflect reader input and are designed to make *Network World* more readable and to help you find items faster.

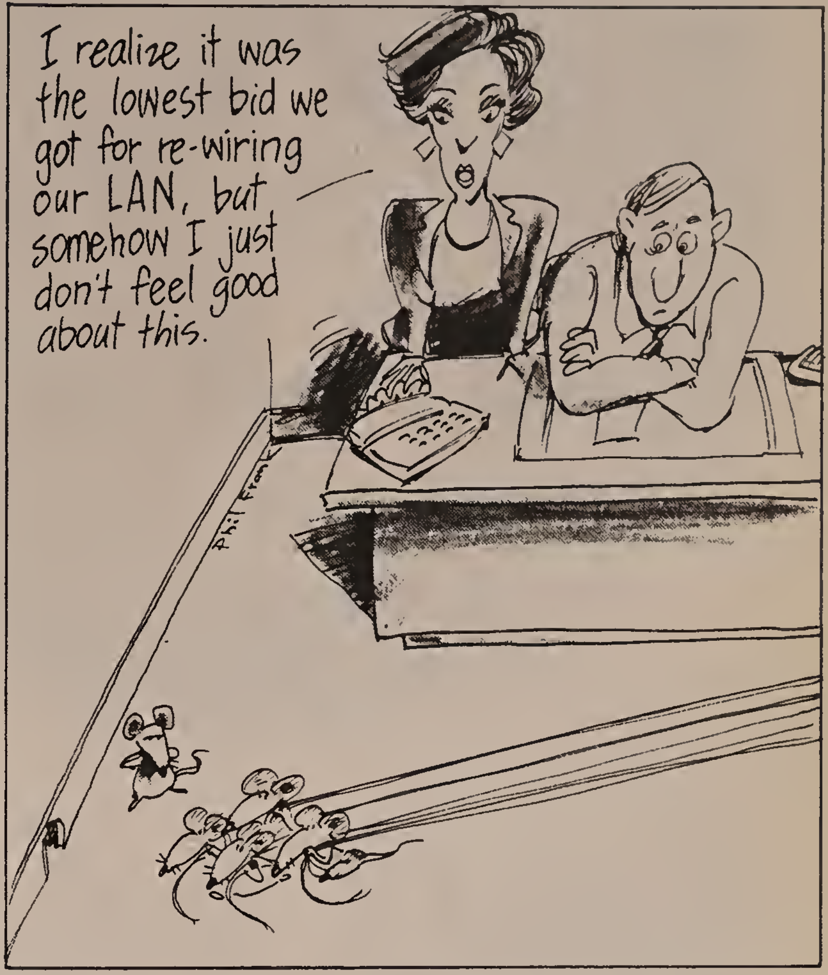
We hope these changes will make *Network World* a more useful tool. As always, we welcome your feedback. ◼

ATTENTION VENDORS OF INTELLIGENT WIRING HUBS: *Network World* invites you to participate in a product survey for the Buyer's Guide slated to appear March 8. This Buyer's Guide will examine the critical selection criteria and current market trends that influence the purchase of intelligent wiring hubs.

To obtain a survey form, call Kyle Nitzsche, associate features editor, at (508) 820-7427. Requests for survey forms must be received by Monday, Jan. 18.

TELETOONS

BY FRANK AND TROISE


I realize it was the lowest bid we got for re-wiring our LAN, but somehow I just don't feel good about this.
Phil Frank

LETTERS

More X-ray vision

I would like to complement Michel Kabay's opinion column ("Protect LANs from the X-ray vision of LAN monitors," *NW,* Nov. 30) by adding a few items.

I have found during my years of service in the data networking department of a large defense contractor and, now, as a systems integrator that security policies must also be instituted to protect data. If security is a real concern, net analyzers should be treated with concern. They should be kept in a secured location when not in use and should not be left unattended in unrestricted areas.

In secured government buildings, secrets are protected by the buddy system, whereby no fewer than two people are allowed in an area at a time. This helps eliminate the urge that one person may have to cause problems. This rule can also be transferred to the use of network analyzers.

Advanced Encryption Systems, Inc. of Santa Clara, Calif., offers several flavors of local-area network encryptors. Novell, Inc. is also tightening security on its NetWare 3.11 and 4.0 with a signature NetWare Loadable Module (NLM), which requires verification between stations on a per-packet basis, as well as an encryption NLM.

A final point to consider is that no network is totally secure. Even if you use encryptors, all that is needed is a LAN analyzer with an attached encryptor to spoil that solution. If the data is in need of more security, don't put it back on the network.

With the propagation of LANs, security needs will also increase — especially since these LANs are being connected to public net vendors.

Rick Meisch
President
Intelligent Solutions
Fort Worth, Texas

Want to respond to an article or opinion in Network World? *Mail typed letters to Editor,* Network World, *161 Worcester Road, Framingham, Mass. 01701, or fax them to (508) 820-3467. Transmit your response via MCI Mail at 390-4868 or to our Bulletin Board System. (See page 2 for BBS instructions.) Letters may be edited for space and clarity.*

SOFTWARE DISTRIBUTION TOOLS

Think software distribution is easy?

The ground rules for selecting software distribution offerings are changing, thereby creating new issues for net managers to mull.

By JAMES KOBIELUS

Users in the market for electronic software distribution (ESD) offerings better brace themselves for a bumpy ride since the industry is in a period of upheaval.

Barely a half-decade old, the market for ESD offerings is in a state of flux. New vendors are emerging, industry standards are still being defined, and the criteria for product selection are changing.

A few years ago, users simply had to decide among a few host-based packages. But now, prior to the product selection process, users must decide whether they want to download software from a central host or from distributed servers located across corporate networks.

The Short List

- IBM NetView Distribution Manager
- Novell, Inc. Network Navigator
- Novell Network Navigator DOS LAN distributor
- Novell Network Navigator OS/2 LAN Distributor
- Systems Center, Inc. AM:PM
- XcelleNet, Inc. RemoteWare Communications Management System

Complete details about The Short List appear on page 101.

This rapid emergence of server-based distribution products is proving to be the greatest change to the nascent ESD market.

IBM and Novell, Inc. already have brought out products in the host- and server-based market segments. Both Systems Center, Inc. and Telepartner International are developing local-area network-based versions of their mainframe ESD products.

Compounding matters, vendors are rushing to establish their own proprietary technologies as de facto standards, despite efforts by other groups to create open standards. The drama over unfolding standards is one users would be wise to watch because vendor decisions to support or pay lip service to such open standards efforts may affect the long-term viability of software purchases.

Users will likely have to wait two to three years to see any open standards incorporated into products, as well as several years more for all the interoperability issues to be ironed out.

The push for standards is being driven by such industry heavyweights as IBM and Novell, which underscores the entry of major vendors to embrace ESD technology into their product portfolios.

Large network and computer vendors will increasingly dominate the ESD market. In the past year, Annatek Corp. hitched up with Novell, Tangram Systems Corp. with Systems Center and Spectrum Concepts, Inc. with Legent Corp. (which has yet to release its long-awaited host-based XCOM Software Distribution System).

While the entrance of big-name vendors will help legitimize ESD, many of the smaller vendors will continue to push the technology to new lengths, offering a wider range of multivendor support than some of the more established vendors that appear set on supporting their own network environments.

A bit further in the future, users may not need to purchase ESD products separately from network operating system (NOS) software because the capability may become a basic service in such packages as Novell's NetWare and Microsoft Corp.'s LAN Manager.

Top selection criteria

Viewed broadly, ESD refers to any system or service that automates the software administration life cycle. ESD offerings can support on-line software license ordering, network distribution of executable and data files, installation of those files on remote nodes, and metering and enforcement of site, usage and other licensing restrictions (see "ESD to manage full software life cycle," page 102).

Gartner Group, Inc. estimates that manual software distribution and installation represent 17% of the total cost of PC software over a 5-year period. Typical enterprises with 2,000 installed PCs can spend $1 million annually performing software distribution and installation. For larger enterprises, this figure can increase to $6 million.

However, remote distribution and installation products constitute the lion's share of today's ESD market. All of the products listed in our survey support these core capabilities.

Regardless of whether users decide to go with host- or server-based ESD

(continued on page 100)

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If you're looking for an internetworking partner, you may feel stranded. Some vendors are experts in LAN networking. Others have experience with WANs. But only Racal-Datacom offers a full range of products and expertise in both.

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Regardless of your computing environment—distributed, centralized or cooperative—we offer the widest selection of internetworking products, all operating under a *single* standards-based network management system.

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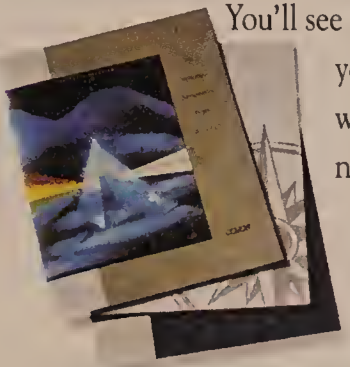

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Software distribution tools

Company	Product	Platform support S = Source node T = Target node							Network support										Distribution features						Management interfaces	Pricing		
		DOS	Macintosh	MVS	OS/2	Unix	Windows	Other	AppleTalk	DECnet	LAN Manager	LAN Server	NETBIOS	NetWare	SNA	TCP/IP	VINES	Other	To groups	Via intermediate node	Unattended	Client-initiated	Rollback/retry	Data file upload/download	N = NetView P = Proprietary	Per user	Per node H = Host S = Server C = Client	Per quarter
Destiny Technology Corp. (914) 923-4307	DeliveryMan	T			S, T	T	S, T				✓	✓	✓	✓					✓		✓	✓		✓		$1,000/ 10 users		
Frye Computer Systems, Inc. (617) 451-5400	Software Update and Distribution System	S, T			S, T		S, T				✓	✓	✓	✓		✓	✓		✓		✓		✓	✓	N, P		$995	
Hewlett-Packard Co. (415) 857-1501	Distributed Update and Install					S, T										✓					✓	✓	✓	✓	P	(1)		
IBM (914) 642-5474	NetView Distribution Manager for MVS 4.0	T		S	T	T	T	T				✓		✓	✓				✓	✓	✓		✓	✓	N, P		H: $50,000 $122,000	
	NetView Distribution Manager/2 2.0	T			S, T							✓		✓	✓				✓	✓	✓		✓	✓	N, P		S: $1,495; C: $95	
NCR Corp. Network Products Division (908) 576-3710	StarSentry Software Manager	S,T			S, T	S, T	S, T				✓			✓	✓	✓		✓	✓	✓	✓	✓		✓	P		$15,000	
Novell, Inc. (303) 444-3494	Network Navigator MVS/VTAM Dispatcher	T		S, T	T		T			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	N		H : $35,000-$50,000; C: $200	
	Network Navigator VM Dispatcher	T			T		T	S, T		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	N		H: $20,000-$30,000; C: $200	
	Network Navigator Tandem Dispatcher	T			T		T	S, T		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	N		H: $20,000-$30,000; C: $200	
	Network Navigator DOS LAN Distributor	S, T			T		S, T			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	N	$1,000/ 5 users		
	Network Navigator OS/2 LAN Distributor	T			S, T		T			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	N	$1,000/ 5 users		
Software Spectrum, Inc. (214) 840-6600	DIAMOND	S, T		S	S, T		S, T				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓				$3,000+
Systems Center, Inc. (703) 264-8000	AM:PM 4	T	T	S	T		T		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	P		H: $75,000+; S: $1,200 (2)	
Telepartner International (800) 935-3270	Synchrony 2.3	T		S	T		T				✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	N		H: $30,000; S: $995; C: $95 (2)	$4,500; onetime: $10,000
Trik, Inc. (617) 933-8810	NetDistributor Pro		S, T						✓									✓	✓		✓	✓	✓	✓	N	$695/100 users (3)		
Unisys Corp. (408) 434-2848	CTOS InControl, Software Distribution Module							S, T							✓				✓	✓	✓		✓	✓	N		S: $15,000-$30,000	
XcelleNet, Inc. (404) 804-8100	RemoteWare Communications Management System	T	T		S, T	T	T	T		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓			S: $12,000; C: $220-$500	

FOOTNOTES:
(1) Bundled with the operating system
(2) Additional modules available
(3) Plus site license fee

SOURCE: JAMES KOBIELUS, ALEXANDRIA, VA.

(continued from page 98)
products, there are several basic issues worth considering.

Platform support is a key criterion to evaluate for ESD offerings. Not only must a product conform to a user's existing network setup, but it should also offer a wide range of support for network hardware, server-based NOSes and network protocols to accommodate changes in network environments.

Users would be wise to consider the range of mainframe operating systems supported, as well as the types of downstream clients that can receive software updates.

Flexibility is another critical factor in evaluating ESD products. They should give the user a variety of options for making software changes. Also, the products should offer net managers the ability to initiate software downloads on a scheduled or as-needed basis, and end users should have the ability to pull updates from a server or host. Flexibility also means the software should have the intelligence to update nodes at night and also track which devices are unavailable so that distributions can be performed at a later time.

Integration of the software with existing network management facilities is another key buying criterion. For example, some packages are integrated into IBM's NetView management system, so users can operate such packages from the NetView console using its familiar interface without having to learn yet another user interface. Also, the net manager can manage the software distribution and installation process from that terminal.

But even before users get to the stage of evaluating which specific products they want to pursue, there's an even more basic question to answer — which ESD strategy to adopt.

Two topologies

Current remote distribution and installation products fall into either of two broad categories. host- and server-based products.

Host-based systems are geared for organizations that prefer to administer the ESD process centrally from mainframe data processing centers. They maintain central software repositories typically under IBM MVS mainframe operating environments and distribute any file, whether executable software, source code or data files, over a variety of Systems Network Architecture and non-SNA networks.

All host-based ESD products support distribution directly to user workstations or through LAN-based servers that serve as store-and-forward control points (see graphic, page 101).

Pricing varies depending on network size and configuration, but basic host-based ESD system pricing can generally run as high as $100,000.

Server-based products represent the fast-growing low end of the ESD market. They allow software repositories to be installed on LAN-based servers or administrator workstations without needing to connect to central host computers. Some — notably entries from Novell and IBM — also support local download, storage and forwarding of software from host-based systems.

Pricing varies depending on network size and configuration, but the basic server-based ESD system can start at less than $1,000 for a small network and $10,000 for a midsize network.

Host-based ESD

The starting point when considering which host-based ESD application to select is matching the package to the organization's existing environment, including the mainframe operating system, the transport and network protocols used, and the type of clients that will receive updates.

Another key criterion is the ability of the package to support client-initiated distribution and installation. This capability frees the network manager from having to coordinate the exact distribution time with the user, allowing the client to download appropriate files at the end user's command, in what is typically referred to as pull-mode distribution.

Users may also want to examine such interoperability issues as whether the package supports IBM's Configuration, Installation and Distribution (CID) architecture or any of the other emerging proprietary or nonproprietary standards.

Host-based ESD packages include: Network Navigator from Novell, AM:PM from Systems Center, Synchrony from Telepartner International and NetView Distribution Manager (DM) from IBM.

This class of software distribution products typically dispenses software from central mainframes running in an IBM MVS/VTAM mainframe environment. Network Navigator also runs on IBM's VM and Tandem Computers, Inc.'s Tandem-Guardian 90

The Short List:

Software distribution tools

The Short List highlights products we recommend you examine during the purchasing process for electronic software distribution (ESD) tools. Products included in The Short List meet the buying criteria we've outlined in the accompanying Buyer's Guide article and, in some cases, offer additional useful features. Those criteria reflect the needs of users with multivendor enterprise networks. Your criteria may differ based on network configuration and application needs.

Host-based ESD

▪ **Novell, Inc.'s Network Navigator.** Of all the host-based electronic software distribution (ESD) offerings, Network Navigator offers the broadest support for multivendor host operating systems, with software versions available for IBM MVS and VM systems, as well as Tandem Computers, Inc.'s Tandem-Guardian 90-based processors. It also supports software distribution directly to local-area network workstations or indirectly via servers.

In addition to NetWare support, Network Navigator works with Microsoft Corp.'s LAN Manager and Banyan Systems, Inc.'s VINES servers, supports host and client-initiated distribution, and allows users to approve or reject scheduled software updates. Additionally, Network Navigator supports monitoring and control of software distributions from within IBM NetView environments.

Pricing ranges from $20,000 to $50,000.

▪ **IBM's NetView Distribution Manager (DM).** It provides the most diverse support of IBM host environments — MVS, VM, VSE and OS/400 — and is the only host-based ESD offering that provides software distribution facilities to Unix nodes. NetView DM supports monitoring and control of software distributions from within IBM NetView environments.

Pricing ranges from $50,000 to $122,000.

▪ **Systems Center, Inc.'s AM:PM.** If it's Apple Computer, Inc. Macintosh support you're looking for, then AM:PM is your product. It is the only one of the host-based offerings capable of downloading software to Macintosh nodes.

Pricing starts at $75,000 for the host software.

Server-based ESD

▪ **XcelleNet, Inc.'s RemoteWare Communications Management System (CMS).** The product is easily the most multivendor-oriented ESD product examined in the Buyer's Guide. It distributes software and data from an OS/2-based NetWare server to MS-DOS, Windows, OS/2, AT&T Unix System V, IBM AIX, The Santa Cruz Operation, Inc. Unix System V, VMS and Macintosh clients.

Software updates can be sent over asynchronous, satellite, switched 56K bit/sec, cellular and radio-frequency modem connections. It supports such network operating systems as Novell's NetWare, VINES, LAN Manager and IBM's LAN Server, and such products as Systems Network Architecture, Digital Equipment Corp.'s DECnet, X.25 and Network Basic I/O System.

Pricing starts at $12,000 for the server software, plus $220 to $500 per client.

▪ **Novell's Network Navigator DOS LAN Distributor and Network Navigator OS/2 LAN Distributor.** These support distribution push and pull modes, allowing net managers or end users to initiate updates. They also run under any version of NetWare and come with support for LAN Manager and VINES. Both packages interface with NetWare bindery, allowing them to automatically generate distribution lists. The Network Navigators provide integration with NetView.

Pricing starts at $1,000 for five users.

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operating system.

Host-based offerings are also noted for using IBM's proprietary SNA protocol suite to communicate with servers and workstations over wide-area networks.

Network Navigator runs under the broadest range of networks, including Digital Equipment Corp.'s DECnet, Transmission Control Protocol/Internet Protocol, NetWare, IBM's LAN Server and LAN Manager. AM:PM supports several LANs and TCP/IP, while Synchrony supports several LANs but not TCP/IP. NetView DM only supports LAN Server, NetWare and SNA.

Another commonality among host-based software distribution facilities is that they can distribute software and data files to servers and workstations that run NetWare or LAN Server NOSes. Additionally, Network Navigator, AM:PM and Synchrony support LAN Manager. Network Navigator and Synchrony also support software distribution through servers running Banyan Systems, Inc.'s VINES.

In general, all host-based products are capable of distributing software to MS-DOS, OS/2 and Windows servers and workstations. AM:PM is the only host-based ESD system that currently distributes updates to Apple Computer, Inc. Macintosh clients. NetView DM is the only one that works with Unix nodes as well as with Big Blue's proprietary VM, VSE and OS/400 operating systems.

Network Navigator is alone in its support for target nodes that run Novell's proprietary DR-DOS operating environment, and Novell is promising Unix and Macintosh client support in the first half of 1993.

Distribution, installation

Host-based ESD products generally support a common set of remote distribution and installation features, although a few products add their own wrinkles to the process.

Host-based ESD offerings generally can download or upload any type of file, including executable software and application data sets. Distribution can be targeted at specific groups of workstations or LANs, or network managers can single out specific devices for distribution.

Remote software installations can be performed at any time of the day or night without requiring users or technicians to be present at target nodes.

Existing server or personal computer software can be backed up to the mainframe when new software is being installed, thereby allowing central administrators to restore the prior software configuration when a remote installation fails.

All host-based ESD systems support administrator-initiated distribution, also known as push distribution, whereby the mainframe takes control of remote nodes in order to deliver and install software updates. Push distribution requires that users leave their servers or PCs turned on overnight in order for unattended software updates.

Fortunately, all mainframe ESD systems allow network administrators to flag unavailable nodes and retry uncompleted installations. Of the host-based ESD products listed in the accompanying chart, only Network Navigator and Synchrony support client-initiated pull-mode distribution.

Network Navigator has two remote distribution/installation features that its competitors do not have. First, it can prompt PC users to approve or reject a scheduled update during the workday, which, if rejected, can be postponed until after-hours. Second, it works with Software Spectrum, Inc.'s Distribution, Installation, Asset Management, ON Demand (DIAMOND), an on-line purchasing and delivery service for commercial software packages and licenses.

Another consideration is whether the package supports IBM's CID architecture. Implemented in NetView DM and NetView DM/2, CID expands the role of the client nodes in facilitating unattended, remote OS/2-based software distributions.

AM:PM and Synchrony can distribute CID-enabled software.

Management, reporting

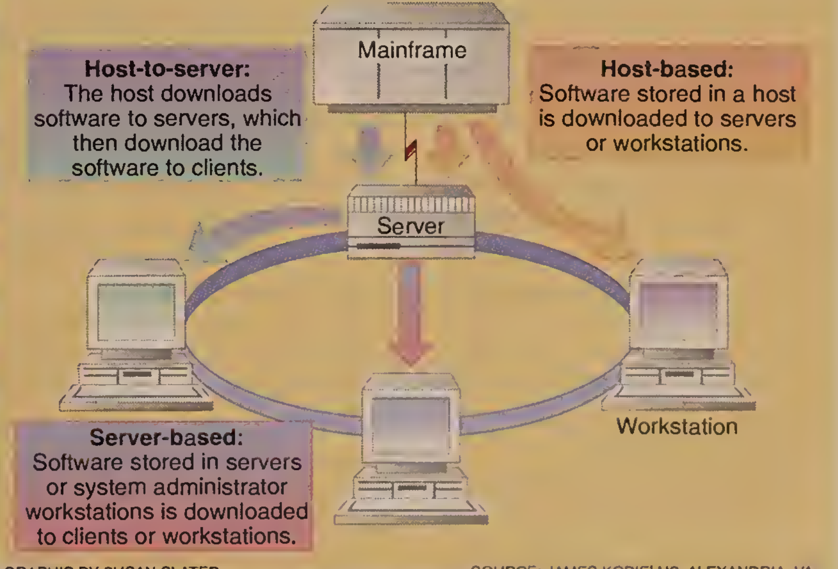
ESD is a function that, logically, should be controlled from within the same network management environment used to perform fault monitoring, inventory management and similar functions. Such integration obviates the need for net managers to learn yet another net management interface.

NetView DM, Network Navigator and Synchrony support monitoring and control of software distributions from within IBM's NetView net management environment. A manager can control the functioning of these applications from a NetView terminal.

ESD vendors are also providing proprietary management interfaces for their host-based products. Novell has announced plans to integrate Network Navigator with its proprietary NetWare Management System, although it has not provided any time frame for doing so. AM:PM can be used with Systems Center's Solve:Configuration and Solve:Change applications, which manage network hardware and software inventories and track changes to systems and network resources.

Three software distribution methods

Figure 1


Mainframe
Host-to-server:
The host downloads software to servers, which then download the software to clients.
Host-based:
Software stored in a host is downloaded to servers or workstations.
Server
Server-based:
Software stored in servers or system administrator workstations is downloaded to clients or workstations.
Workstation

GRAPHIC BY SUSAN SLATER

SOURCE: JAMES KOBIELUS, ALEXANDRIA, VA.

All host-based ESD systems support automated network inventory management — sometimes referred to as asset management, which involves maintaining up-to-date, comprehensive, mainframe-based records of hardware and software on network nodes. Automated inventory management allows net administrators to track software versions across the network, identify upgrade requirements and verify node configurations prior to remote software distribution and installation.

Server-based ESD

Organizations that lack mainframe computing resources and have a considerable investment in LANs and WANs may benefit by exploring server-based ESD tools. They are less expensive, run on hardware and operating systems that may already be installed — such as NetWare — and typically offer features that are comparable to host-based packages, including scheduling flexibility, push and pull distribution, reporting capabilities, and transaction rollback and retry.

But host-based systems may be the better choice if a firm has a very large network with thousands of nodes or if it is already committed to mainframe-style computing.

The criteria for selecting server-based ESD applications are much the same as host-based products, including fitting into the existing environment, scheduling flexibility and such features as client-initiated distribution.

Competitors in server-based ESD include Novell and IBM (which market LAN versions of their host-based products); NCR Corp.; Hewlett-Packard Co.; Unisys Corp.; and less familiar names such as XcelleNet, Inc., Frye Computer Systems, Inc., Destiny Technology Corp. and Trik, Inc.

Platform, net support

Server-based ESD products generally fall into two distinct

(continued on page 102)

(continued from page 101)

camps: those that are geared toward a single operating environment or those that distribute software across a multivendor network.

Multivendor-oriented ESD products include Novell's Network Navigator DOS LAN Distributor and Network Navigator OS/2 LAN Distributor, NCR's StarSentry Software Manager, XcelleNet's RemoteWare Communications Management System (CMS), Frye's Software Update and Distribution System and Destiny's DeliveryMan.

These products run under NetWare or LAN Manager, while most also support VINES and LAN Server. All support fan-out distribution to DOS, OS/2 and Windows-based LAN workstations, the ability to download files from either a mainframe or another server and then distribute them to clients.

Other than those similarities, the server-based products tend to differ mostly in the environments in which they were designed to run.

Server-based products support various protocol sets, such as DECnet, the Network Basic I/O System, TCP/IP and SNA/LU 6.2, as well as client and operating environments such as Windows, MS-DOS, OS/2 and Unix.

XcelleNet's RemoteWare CMS is easily the most multivendor-oriented ESD product examined in this Buyer's Guide. It distributes software and data from an OS/2-based NetWare server to MS-DOS, Windows, OS/2, AT&T's Unix System V, IBM's AIX, The Santa Cruz Operation, Inc.'s Unix System V, VMS and Macintosh clients.

Distributions can be sent over asynchronous very small aperture terminal connections, as well as switched 56K bit/sec, cellular and radio-frequency modem connections.

The product runs on servers supporting various NOSes, including NetWare, VINES, LAN Manager and LAN Server. RemoteWare CMS also supports such protocols as SNA, DECnet X.25 and NETBIOS.

ESD products that run in homogeneous operating environments include IBM's NetView DM/2, which works only with OS/2 servers and clients; HP's Distributed Update and Install, which works with the HP/UX Unix-based operating system; Unisys' CTOS InControl, Software Distribution Module, which works with the CTOS operating system; and Trik's NetDistributor Pro, which runs on Macintosh platforms.

As a CID-compliant product, NetView DM/2 allows OS/2 servers to manage customized, unattended software installations on client OS/2 workstations. IBM has committed to upgrading NetView DM/2 to support DOS clients.

However, IBM has no plans to support desktop environments other than OS/2 and DOS within NetView DM/2, according to Alan Higginbotham, IBM's CID development manager.

Distribution, installation

Server-based ESD products support distribution and installation features comparable to those available in host-based products. Many server-based products support essential ESD capabilities such as push and pull distribution; group and individual distribution; unattended, off-hours installation; fan-out distribution through intermediate servers; and rollback and retry of unsuccessful installations.

Novell's and IBM's LAN-based products support the same distribution/installation features as their host-based cousins. Both products provide local fan-out of software and of data downloaded from mainframes.

Other server-based products provide sophisticated distribution and installation features in LAN/WAN environments, independent of mainframe data processing centers.

Destiny's DeliveryMan allows distributions to be carried out when the client boots up for the first time each day — either in background mode if the user is in the middle of an application or when the client logs on to the LAN server. It supports simultaneous updates across multiple nodes, ensuring that all users have the latest version of an application.

Stan Hoptroff, data networks manager for Atlanta-based Georgia Power Co., is one of Destiny's first customers for DeliveryMan. He is taking a cautious approach to implementing ESD. Since October 1992, he has distributed software from a central server to just a few hundred of Georgia Power's 4,000 workstations.

Hoptroff, who praises DeliveryMan's ease of use and scheduling capabilities, says the system is appropriate for LAN-based internetworks like his that have fewer than 5,000 nodes. Host-based ESD products would be more suitable for larger enterprisewide networks, he adds. Also, mainframe systems administrators at Georgia Power's parent company are evaluating host-based ESD products for SNA nets.

Management, reporting

In addition to IBM's NetView DM/2, several server-based products support management interfaces to NetView. Server-based ESD products that interface with NetView include Frye's Software Update and Distribution System, Novell's Network Navigator DOS LAN Distributor and Network Navigator OS/2 LAN Distributor, Trik's NetDistributor Pro and Unisys' CTOS InControl, Software Distribution Module.

Some server-based products operate within vendor-proprietary network and systems management environments.

Novell's server-based Network Navigator products have been made NetWare-aware through interfaces to the NetWare bindery. This enables distribution lists and authorized supervisor lists to be generated automatically.

Ultimately, Novell will integrate Network Navigator with the NetWare Network Management System, according to Barbara Goldworm, the firm's product line manager. However, Novell has not yet announced a time frame for release of the integrated capability.

NCR's StarSentry Software Manager — in conjunction with other StarSentry products — allows managers to support a wide range of network management functions. The StarSentry Software Manager uses StarSentry map functions to track remote node configurations and fault monitoring functions in order to trigger alarms when scheduled distributions have been interrupted or aborted.

A word of caution

ESD will almost certainly become standard operating procedure for most companies in the next 10 years.

The traditional approach — carrying diskettes to each node and manually supervising the installation process — is an anachronism in a world of ubiquitous networks. Manual distribution is tedious, time-consuming and a waste of highly qualified employees' time.

But one word of caution: Network managers would be wise not to commit prematurely to any particular ESD vendor, product or standard.

In a young market such as this one, new vendors are likely to upset the status quo. While today's alliances appear to be on firm footing, evolving market needs and standards may soon render them obsolete.

All the ground rules are changing.

It is even possible that, a few years hence, users will not be required to to purchase separate ESD products since the capability might be bundled with a system's or network's operating system. ◻

Kobielus, a contributing editor to Network World, *is a telecommunications analyst with Fairfax, Va.-based Network Management, Inc., a local- and wide-area network systems integrator.*

The evolution of software distribution tools

With barely half a decade under its belt, the electronic software distribution (ESD) market is mature enough to have passed through 3 generations of technological evolution:

First-generation ESD: Involved use of point-to-point file-transfer systems, E-mail, bulletin boards, mainframe virtual diskette systems or workstation remote-control systems to move software files between network nodes.

Second-generation ESD: Introduced network hardware/software configuration analysis, group distribution, unattended installation, on-line transaction-status reporting and other capabilities geared for ESD. These solutions involved distribution from host-based software repositories direct to network nodes.

Third-generation ESD: All of the products discussed in this Buyers Guide fall into the third generation, although some have their roots in second-generation products. Some distribute software from host-based repositories directly to servers or workstations while also using servers for store-and-forward distribution to workstations. Others use server-based software repositories to distribute directly to workstations or through other servers on a store-and-forward basis.

ESD to manage full software life cycle

While electronic software distribution (ESD) was once just a means of transmitting and installing software across a network, it is now evolving into a tool to administer the complete software life cycle encompassing acquisition, version tracking, software updates and license management.

Evidence of this trend can be found in developing standards and new ESD-based services offered by several software resellers that will manage the complete software life cycle.

Cambridge, Mass.-based Open Software Foundation, Inc. and Unix System Laboratories, Inc. of Summit, N.J., are developing open standards for software distribution, which include license management in heterogeneous, multivendor networks. Both organizations are developing their ESD standards as components of comprehensive network management frameworks.

Another sign of ESD's broadening scope is its use by software resellers, which are beginning to provide life-cycle software administration services for corporate customers.

Software Spectrum, Inc. of Garland, Texas, and Softmart, Inc., of Philadelphia are setting the pace with on-line services that allow corporate customers to order licenses for shrink-wrapped commercial software, download and distribute the software files within their organizations, and perform unattended, off-hour installation. Both resellers use leading ESD products to manage remote distributions and installations.

Software Spectrum's Distribution, Installation, Asset Management, ON Demand (DIAMOND) service, available since last September, allows customers to order new licenses electronically and take delivery of software through Novell, Inc.'s Network Navigator or Telepartner International's Synchrony ESD systems. DIAMOND can be configured to require customers to input purchase order numbers before software distribution occurs.

Successful software installation results in a purchase being reported electronically to Software Spectrum and, in turn, to the software publisher for proper invoicing, payment and license tracking.

Last September, Softmart announced it was developing a remote distribution/installation capability to be integrated with its Automated Software Administration Process (ASAP) service.

Currently, ASAP supports on-line ordering of new software packages through its Advanced Customized Client Electronic Support Service. It also supports ordering of additional licenses for software previously acquired through Softmart's Electronic Licensing Program. Softmart provides on-line license ordering for 17 major software publishers, including Borland International, Inc., Lotus Development Corp., Microsoft Corp. and WordPerfect Corp.

Softmart plans to integrate its ASAP on-line software license ordering services with Novell's Network Navigator DOS LAN Distributor ESD system.

Softmart has not announced when the remote distribution and installation capabilities will be available to users.

— James Kobielus

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199	200	201	202	203	204	205	206		

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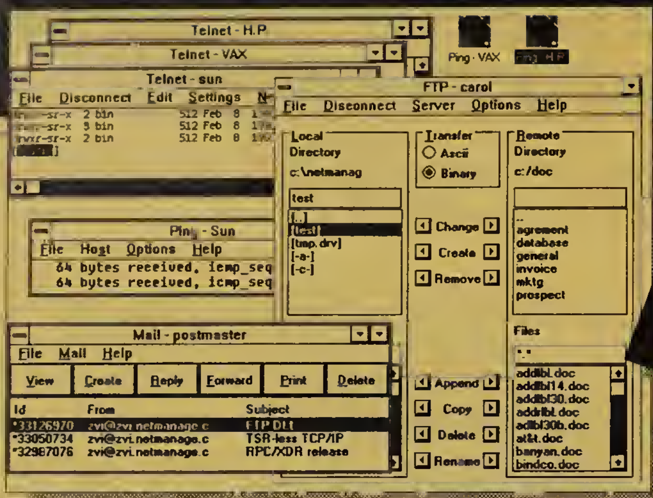

```
-sr-x  2 bin      512 Feb  8
-sr-x  3 bin      512 Feb  8
rwxr-sr-x  2 bin      512 Feb  8
```

```
64 bytes received, icmp_seq
64 bytes received, icmp_seq
```

```
test
[..]
[test]
[tmp.drv]
[-a-]
[-c-]
```

```
..
agrement
database
general
invoice
mktg
prospect
```

```
*.*
addlbl.doc
addlbl14.doc
addlbl30.doc
addrlbl.doc
adlbl30b.doc
at&t.doc
banyan.doc
bindco.doc
```

```
Id          From                   Subject
*33126970   zvi@zvi.netmanage.c    FTP DLL
*33050734   zvi@zvi.netmanage.c    TSR-less TCP/IP
*32987076   zvi@zvi.netmanage.c    RPC/XDR release
```

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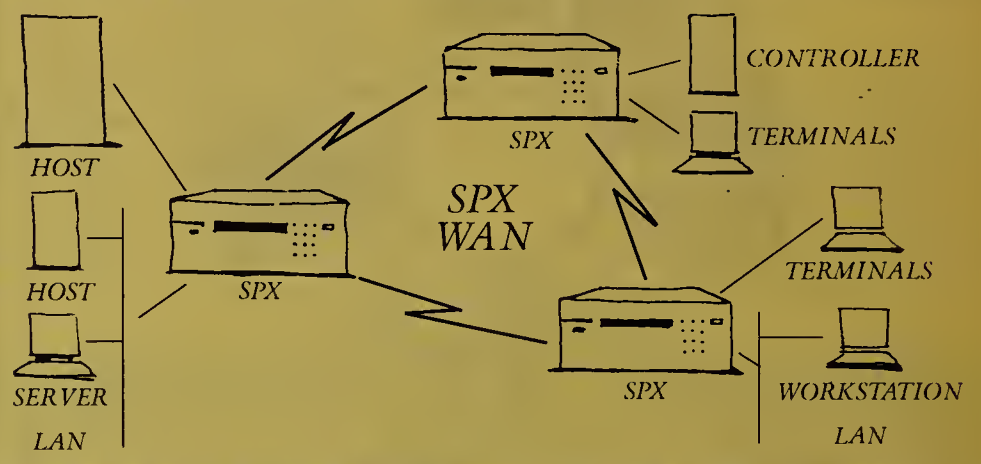

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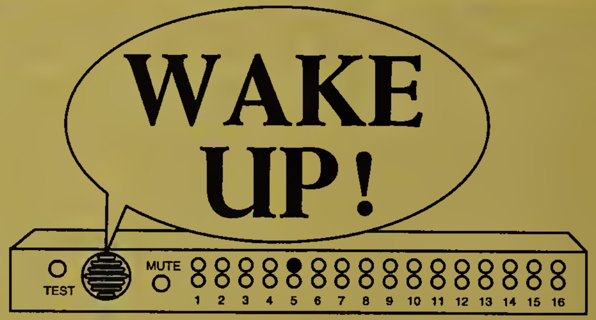

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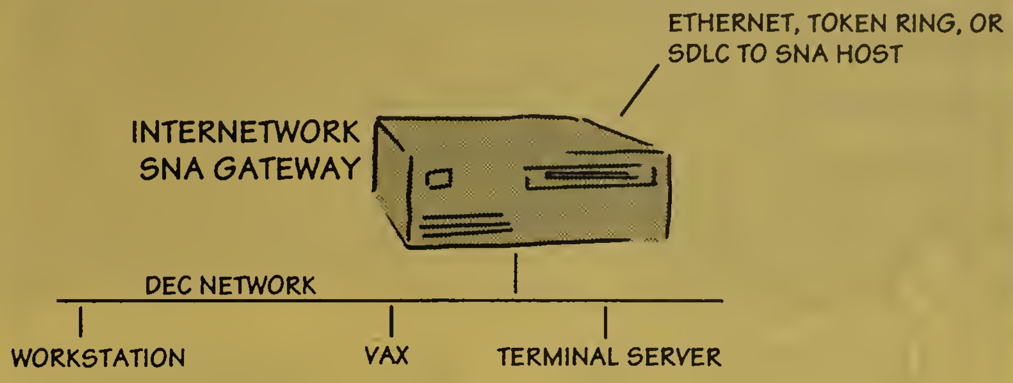

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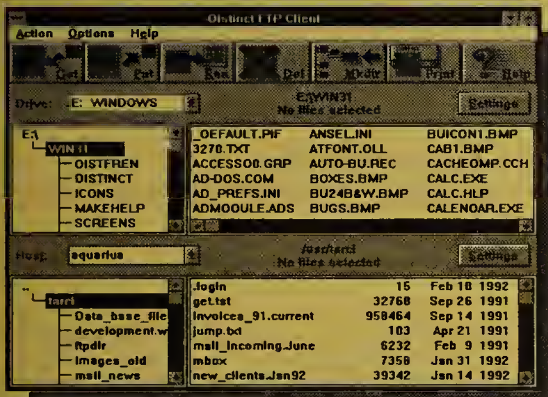

```
Drive: E: WINDOWS        E:\WIN31
                         No files selected
E:\
 └WIN31        _DEFAULT.PIF    ANSEL.INI      BUICON1.BMP
   ─DISTFREN   3270.TXT        ATFONT.DLL     CAB1.BMP
   ─DISTINCT   ACCESSOO.GRP    AUTO-BU.REC    CACHEOMP.CCH
   ─ICONS      AD-DOS.COM      BOXES.BMP      CALC.EXE
   ─MAKEHELP   AD_PREFS.INI    BU24B&W.BMP    CALC.HLP
   ─SCREENS    ADMODULE.ADS    BUGS.BMP       CALENDAR.EXE

Host: aquarius           /usr/tarti
                         No files selected
..
 └tarti         .login                      15   Feb 18 1992
   ─Data_base_file get.tst               32768   Sep 26 1991
   ─development.w invoices_91.current   958464   Sep 14 1991
   ─ftpdir        jump.txt                 103   Apr 21 1991
   ─images_old    mail_incoming.June      6232   Feb  9 1991
   ─mail_news     mbox                    7358   Jan 31 1992
                  new_clients.Jan92      39342   Jan 14 1992
```

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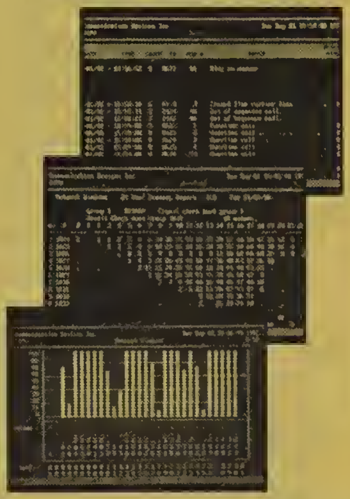

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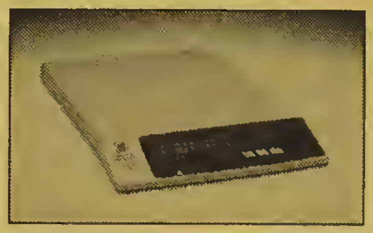

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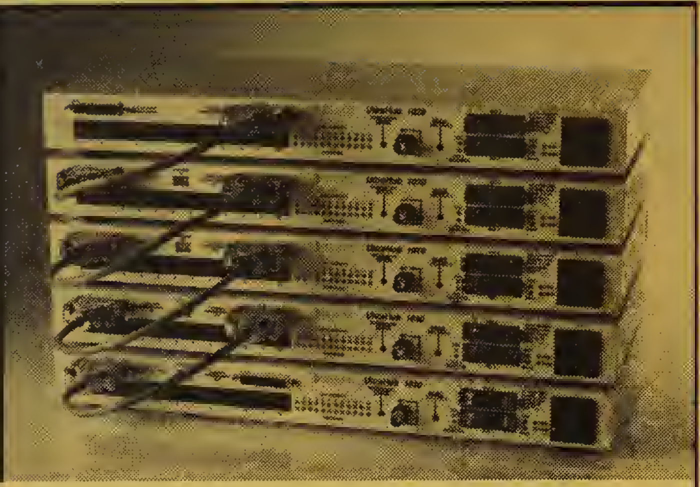

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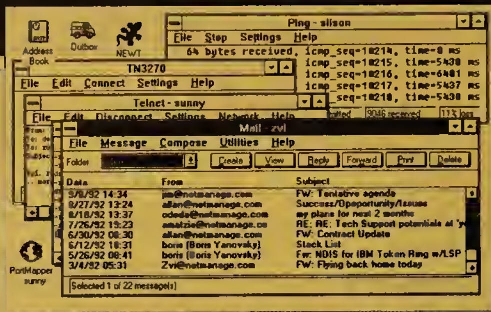

Ping - alison
File Stop Settings Help
64 bytes received, icmp_seq=10214, time=0 ms
icmp_seq=10215, time=5430 ms
icmp_seq=10216, time=6401 ms
icmp_seq=10217, time=5437 ms
_seq=10218, time=5430 ms
9046 received

TN3270
File Edit Connect Settings Help

Telnet - sunny
File Edit Disconnect Settings Network Help

Mail - zvi
File Message Compose Utilities Help
Folder Create View Reply Forward Print Delete

Date	From	Subject
9/9/92 14:34	jm@netmanage.com	FW: Tentative agenda
8/27/92 13:24	allan@netmanage.com	Success/Opportunity/Issues
8/18/92 13:37	odeda@netmanage.com	my plans for next 2 months
7/26/92 15:23	amalzie@netmanage.co	RE: RE: Tech Support potentials at 'y
6/30/92 08:30	allan@netmanage.com	FW: Contract Update
6/12/92 18:31	boris (Boris Yanovsky)	Stack List
5/26/92 08:41	boris (Boris Yanovsky)	Fw: NDIS for IBM Token Ring w/LSP
3/4/92 05:31	Zvi@netmanage.com	FW: Flying back home today

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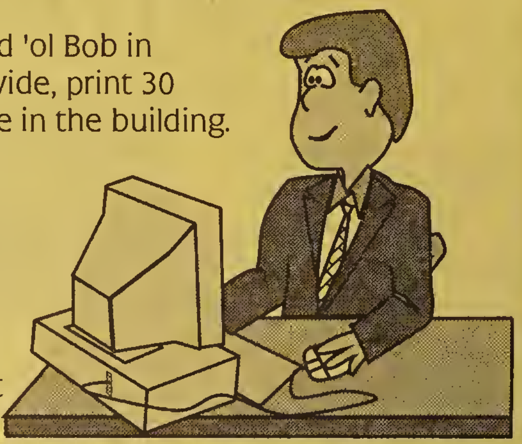

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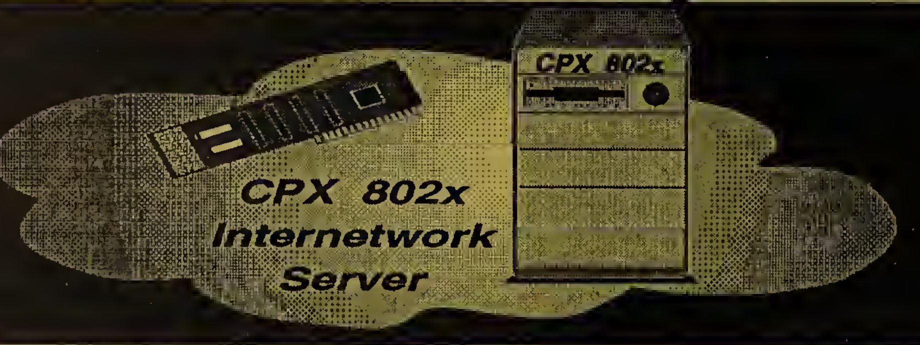

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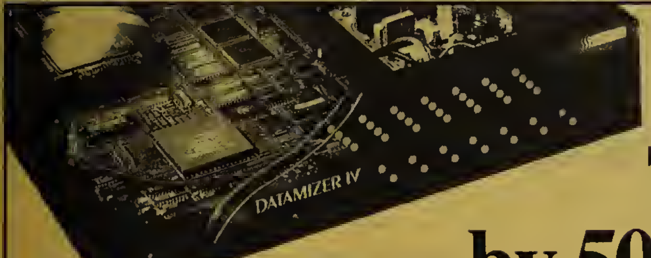

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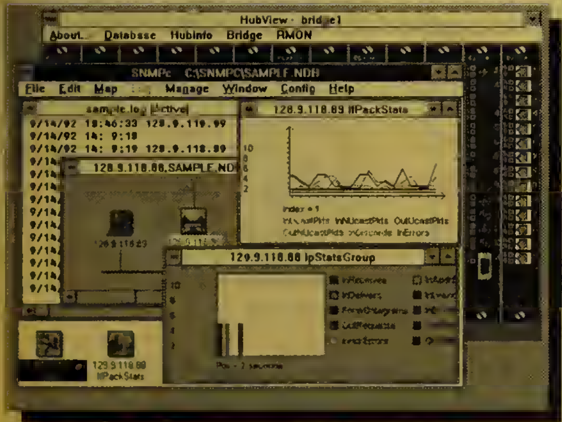
HubView - bridge1
About... Database HubInfo Bridge RMON
SNMPc C:\SNMPC\SAMPLE.NDB
File Edit Map Manage Window Config Help
sample.log [active]
128.9.118.89 IfPackStats
128.9.118.88.SAMPLE.NDB
129.9.118.88 IpStatsGroup

```
9/14/92 13:46:33 128.9.119.99
9/14/92 14: 9:18
9/14/92 14: 9:19 128.9.118.89
```

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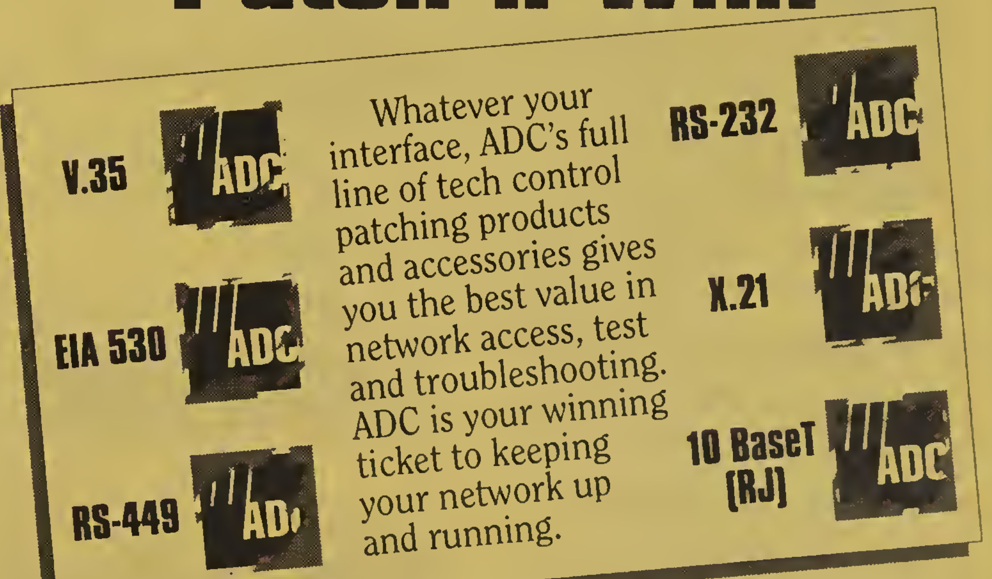

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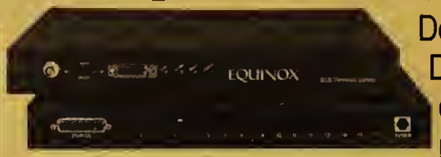

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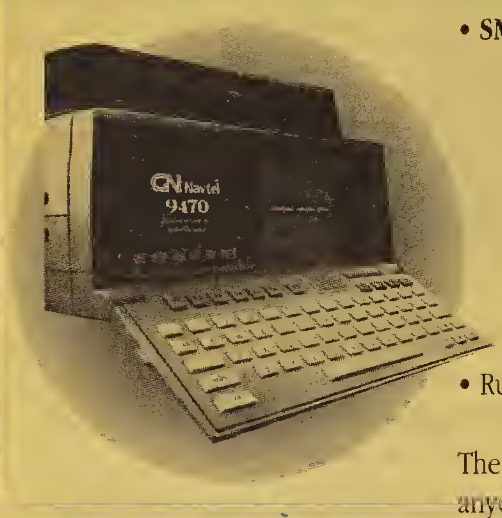

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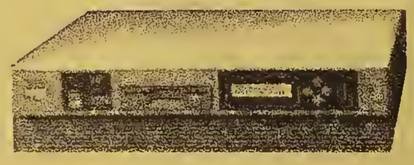

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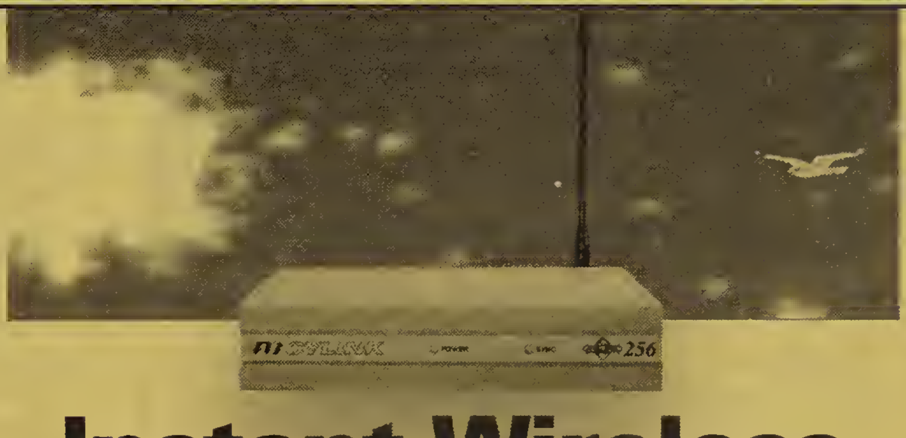

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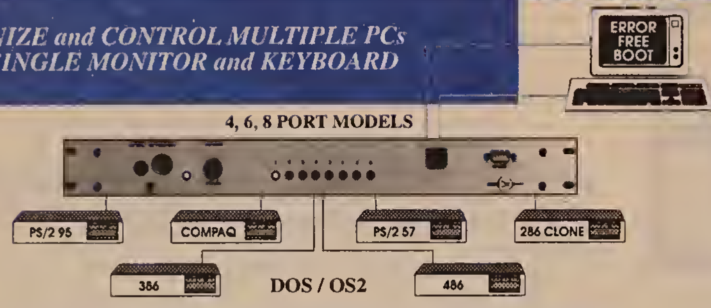

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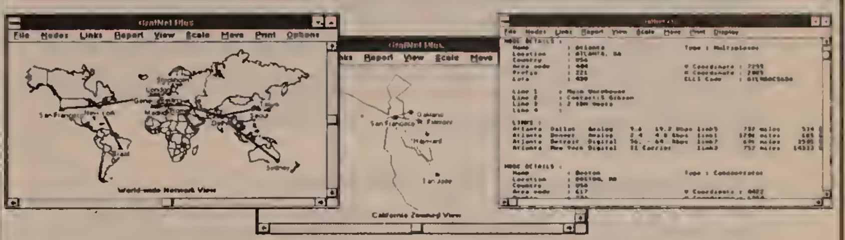

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Attachmate works with IBM

continued from page 4

server software. The client component runs on Microsoft Corp. DOS- and Windows-based PCs and provides the user interface. The server software runs on any LAN-attached microcomputer based on an Intel Corp. 80286 or higher end microprocessor, providing connectivity via native IBM protocols such as Systems Network Architecture Distribution Services and LU 6.2 to IBM-based mail systems.

NETWORLD 93 BOSTON

Gregory Sokoloff, general manager of office systems at Attachmate, said the company is adding support for Novell, Inc.'s Message Handling Services (MHS), Microsoft's Microsoft API and Lotus Development Corp.'s Vendor Independent Messaging application program interfaces to enable the server software to work with other vendors' mail clients.

"We're focusing on the connectivity piece and not looking to compete with Lotus, cc:Mail and Microsoft in the PC LAN E-mail business," he said.

Calendar feature

Zip/Office differs from existing products used to link IBM and LAN-based systems in several ways, Sokoloff said. Whereas gateways typically support only mail exchange between systems, Zip/Office also supports the integration of calendar information, a popular PROFS feature.

Unlike gateways, Zip/Office requires no tinkering with host software, Sokoloff said. This is largely because of its use of native IBM protocols, which also eliminate protocol conversion software.

David Ferris, president of Ferris Networks, a consulting firm in San Francisco, said Zip/Office's best feature is that it enables users to perform calendar scheduling across both PROFS and Zip/Office systems. While scheduling is a popular function among PROFS users, few LAN-based systems have good calendaring capabilities, he said.

Satisfied user

Comdisco, Inc., a Rosemont, Ill., computer leasing and disaster recovery planning company, has been a Zip/Office beta user and plans to stick with the product largely because it provides "one unified communications system across all of our platforms," said Bob Passarella, manager of strategic systems at Comdisco.

Zip/Office, which is available now, is priced based on configuration. Server software pricing begins at $89 per mailbox, and client software starts at $49.

Banyan ready for new release

continued from page 4

than having to know the name of a specific resource.

On the management side, StreetTalk III lets administrators rename users and move groups across the network while keeping their profiles intact. With the current version, administrators cannot move a user's name without deleting the user's profile and cannot move a group from one server to another without downloading the information to tape and uploading the information to the new server.

Further strengthening the already strong support for wide-area links, Banyan has added T-1 Server-to-Server and ISDN Server-to-Server options to VINES 5.50. The new version also includes source routing capabilities.

Using third-party adapters, the new VINES will support T-1 and fractional T-1 speeds up to 1.54M bit/sec and an ISDN Basic Rate Interface supporting two 64K bit/sec and one 19.2K bit/sec channels.

The new source routing feature lets VINES Internet Protocol packets be routed over remote token-ring bridges, allowing token-ring LAN-to-LAN connectivity over wide-area networks. According to Banyan, this will be most useful for customers that need to support IBM host connectivity and large file transfers.

VINES 5.50 is available now, ranging in price from $1,495 for the five-user version to $8,495 for an unlimited number of users. The T-1 and ISDN options are also available now for $3,995 and $2,495, respectively.

Cabletron poised for ATM rollout

continued from page 27

has not yet been set.

In the third phase, Cabletron will provide a next-generation hub that will feature an ATM cell switching architecture and a backplane capacity in excess of 2G bit/sec. It will support all the traditional LAN interfaces, plus ATM connections and more users than the current MMAC.

"Essentially, the backplane transforms into a cell-based switching mechanism, which allows the packets coming out of the Ethernet board to cross the switching fabric in cell format and come out through an ATM connection," Skubisz said.

The front-panel ATM connections — which are fiber optic, both multimode and single mode — will provide an uplink into ATM backbone switches as well as a file server or high-performance I/O workstation that is serviced by the same wiring closet.

The hub is expected by the fourth quarter of this year, and pricing has yet to be determined.

New breed of adapters

The final phase of the Cabletron plan involves the provision of new ATM interface cards for a variety of personal computer, Macintosh and high-speed workstation devices.

These new adapters, which are slated for delivery in the second quarter of 1994, will support shielded and unshielded twisted-pair ATM connections. They will also support fiber-optic ATM links for the Macintosh NuBus 90 Series, Micro Channel Architecture and Extended Industry Standard Architecture PCs, as well as high-speed devices from Digital Equipment Corp., Hewlett-Packard Co., NeXT Computer Corp., Silicon Graphics, Inc. and Sun Microsystems, Inc.

The cost of the adpaters is expected to fall within the range of similar devices supporting Fiber Distributed Data Interface over copper wiring, dubbed CDDI.

"Pricing is always a function of time and volumes, so by mid-1994, we expect these adapters to be competitive with CDDI prices in that time frame," Skubisz said. "It's our goal to garner a substantial portion of the desktop market share by 1995."

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Oracle V.7 a problem

continued from page 1

tion to light (see page 2 for BBS instructions).

"Our developers are chomping at the bit to get at Version 7," Scoggin said. But, he added, "we don't have the time or resources to spend with SCO Unix to feel comfortable with it at this point."

Oracle said it will support Version 6 of its database on the older VINES systems for 18 months. For Version 7 and subsequent releases, Oracle will only support open Unix environments for VINES such as SCO Unix or IBM's AIX, which is rumored to be the next Unix platform to which VINES will be ported.

"Any time you face a major technological shift, it's painful for both the vendors and the customers," said Jim Sha, vice-president of the Unix product division at Oracle. "Since our internal resources are not growing, we have to be judicious about which platforms we choose to support."

Banyan tried to paint the situation in a positive light. "There are real advantages in moving to an open Unix platform in terms of performance and tuning of the system," said David Penzias, director of business development for partnership solutions at Banyan. "In addition, we will be offering an attractive upgrade program to make good on our customer commitment."

Another big Banyan user, BellSouth Mobility in Florida, was also anticipating deploying Oracle Version 7 on its net of Banyan servers. The company has no plans to move to the SCO Unix-based VINES. "We'd be concerned if Oracle chose not to implement Version 7 on the Banyan servers because we are looking at implementing a range of new Windows-based database applications in the Banyan environment," said John Silling, general manager of data systems at BellSouth Mobility in Fort Lauderdale, Fla.

If Oracle does not run on the Banyan servers, he said his company would need to look into switching to another database.

Delamarva currently has 33 Banyan servers in 13 locations, with Oracle running on eight. The company planned to expand the Banyan network to as many as 50 servers by year end.

With this work load and no increase in staff expected, Scoggin said database development needs to be done as efficiently as possible. He anticipates that the firm will concentrate its programming efforts on its Sun Microsystems, Inc. SPARCserver 10s.

"It looks like we'll start shifting all new Oracle development to our Sun servers," he said. "We're already familiar with Sun, and we will just have to link new Oracle applications to the corporate Banyan net. By going to Sun for our database servers, we gain a more reliable and scalable Unix platform than the PC-based servers can offer."

NETWORK WORLD'S

R.A.F.

READER ADVOCACY FORCE

Banyan's Penzias said the Oracle situation is somewhat unique because Oracle is entirely a server-based application. Most VINES software, he said, is client-based and works by accessing standard back-end VINES services. Those applications will not be affected by the switch to SCO Unix.

However, the SCO Unix version does not yet support the VINES wide-area networking options that many large companies have used for years. Unless Banyan delivers the full product suite on SCO Unix, users are expected to resist any major migration plans to the open Unix platform.

Both Banyan and Oracle said they would reconsider their positions if enough customers demanded support of Banyan's proprietary Unix-based VINES servers. However, Penzias said most users will switch when they see the benefits of moving to an open Unix environment.

NIST takes steps to frame relay

continued from page 6

tory OSI specification, and agencies have only a limited ability to implement frame relay networks, said Doug Montgomery, a computer scientist at NIST involved in organizing the trial.

Frame relay service is included in a draft of the new IGOSS version, which is expected to be issued in early 1994. The trial should help identify any technical glitches that need to be worked out before the final IGOSS document is issued.

The purpose of the trial, which will involve OSI applications such as X.400, File Transfer, Access and Management (FTAM) and Virtual Terminal, is to test newly issued encapsulation and interface standards for frame relay.

The trial is geared to proving that the technology can support OSI applications, rather than trying new technologies, said Mike Levender, general manager for StrataCom's federal systems group. "Virtually everything in the trial is commercial off-the-shelf products," he said.

Wellfleet preps OSI router

continued from page 2

A handful of other vendors, including Cisco Systems, Inc. and Proteon, Inc. already support the OSI protocols. IS-IS is the OSI router-to-router protocol, while ES-IS provides a way for hosts and routers to locate each other on the network. CLNP, is the OSI equivalent of the Internet Protocol for connectionless-mode routing.

CLNP and ES-IS are already government purchasing requirements under the Government OSI Profile (GOSIP) issued by the National Institute of Standards and Technology.

IS-IS, the final link in the routing chain, will be included in the third version of GOSIP expected to be issued this February and slated to become a mandatory purchase requirement in 1994.

Certified by NIST

Wellfleet intends to have the OSI router certified for conformance under NIST guidelines, Fowler said.

NIST has approved tests for CLNP in third-party labs but has not yet established testing requirements for ES-IS or IS-IS.

No router vendor to date has obtained GOSIP certification to be listed on the GOSIP register of approved products. "We're going to do performance testing and take a leadership role in it," Fowler said.

HSSI interface

Wellfleet last week said it will also roll out by month's end an HSSI card that will enable its routers to accommodate 45M bit/sec T-3 service, high-speed frame relay links, as well as Switched Multimegabit Data Service and Asynchronous Transfer Mode services.

HSSI is an emerging standard for a physical interface used to link data communications equipment to data terminal equipment at any speed up to 52M bit/sec.

Wellfleet's HSSI interface is a single-port, full-duplex synchronous serial interface card that fits into the vendor's Link Node, Concentrator Node and Backbone Node routers.

According to David Yates, Wellfleet's director of product marketing, the 1G bit/sec Backbone Node can be configured with as many as 13 HSSI cards to support large Synchronous Optical Network or T-3 nets, for example.

The HSSI board, which supports all of Wellfleet's routing and bridging protocols, will cost between $9,000 and $15,000, depending upon router configuration.

Novell, AT&T ink pact

continued from page 2

allow users to choose names from a directory, instruct the system to call each person and send each an E-mail message. In this fashion, each person would have simultaneous access to both the E-mail document and the conference call.'

The end user will see no difference in day-to-day NetWare networking aside from the additional capabilities provided through PassageWay and, ultimately, third-party applications, according to the companies.

End users' phones are neither connected to the desktop machine nor directly to the server. Instead, the PBX connects to a server-resident adapter and driver. The server then provides the final connection to the workstations.

Company representatives also stressed that Telephony Services for NetWare is not a new type of remote dial-in capability. Because the system is inherently NetWare-based, the applications can only be used by NetWare users for outbound calling.

"I need to be on the network to access and make use of the PBX," said Barry Karafin, vice-president of marketing and strategic planning at AT&T.

The new products and APIs will be available during the second half of this year. Pricing has not yet been set.

Good idea, but not yet

Although observers did not seem overly impressed with the initial fruits of the new Novell-AT&T relationship, the longer term possibilities are substantial.

"This could potentially be a big, big deal," said Cheryl Currid, president of Currid & Co., a consulting company in Houston. "There will probably be applications developed for this that we can't even conceive of yet."

Analysts stressed that the idea of linking computers and telephones is not new, noting that various host-to-PBX products already exist, for example. However, this is the first time such an endeavor has been undertaken in a hardware-independent environment, they said. And this is the first time the system will be open for third parties to not only develop their own client or server applications, but also to add their own PBXs.

"The fundamental thing here is that this is not a proprietary system; this is open on both sides," said Jamie Lewis, vice-president of The Burton Group, a Salt Lake City consultancy.

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StrataCom to stake ATM claim

continued from page 1

on frame relay compatibility and analysts now estimate that 90% of all frame relay links into StrataCom's existing IPX switches come from Cisco routers.

Although AT&T's role in the announcement was not entirely clear, some analysts believe the carrier will announce plans to work with StrataCom and Cisco to develop a gateway that will connect frame relay and ATM networks.

They also believe AT&T may eventually use the BPX in its InterSpan public frame relay network to offer higher speed frame relay and ATM services.

InterSpan is currently based on StrataCom's IPX switches.

All three vendors declined to comment on the announcement, but StrataCom has invited the press to an ATM-related briefing here this week in which Cisco and AT&T will participate.

The switch skinny

Sources said StrataCom based the BPX on a switching matrix as opposed to a bus-type architecture to provide lower latency. The switching matrix can operate at up to 9.6G bit/sec when configured to allow blocked connections and 4.3G bit/sec in a nonblocking mode, sources said.

The BPX will also feature priority queuing, in which delay sensitive traffic is buffered in short queues and sent into the network more frequently than less delay-sensitive traffic.

The switch will also use StrataCom's ForeSight software for congestion control. ForeSight, which currently runs in the IPX, allows permanent virtual circuits to burst above their committed information rates to take advantage of idle trunk bandwidth.

> "We have several applications driving us more and more toward broadband services."
>
> ▲▲▲

The price of the BPX, along with the number of slots and ports it supports, was unavailable at press time. Analysts expect the switch to ship in the fourth quarter or the first quarter of 1994.

The ATM module for the IPX, meanwhile, called the ATM Trunk Module, will connect the older StrataCom switches to the BPX at T-3 rates. The module converts the IPX's 24-byte cells to standard ATM 53-byte cells and supports channelized and nonchannelized T-3 links to hybrid public/private services and ATM-based services, respectively.

The competition

Analysts said the BPX will compete with Newbridge Networks, Inc.'s 36150 MainStreet multiplexer and is comparable to TRW, Inc.'s Broadband Access Switch 2010, which Sprint Corp. is using in an ATM net it is building for the Department of Energy.

Newbridge's 36150 is a 64-slot, 256-port Synchronous Optical Network mux for private local- and wide-area networks that houses ATM and time-division multiplexing buses. It is priced from $3,000 to $10,000 per port.

Some StrataCom users are anxious for the higher performance switches. "We have several applications driving us more and more toward broadband services," said John Boyd, supervisor of communications systems at Northeast Utilities in Hartford, Conn. His firm has off-site tape silos for disaster recovery, security applications, optical jukebox storage devices and distributed LANs, and multiple T-1 lines that are ripe for broadband services.

Boyd said Northeast Utilities is evaluating several ATM switches, but he would not say whether BPX is one of them. He is, however, speaking at this week's announcement. ◘

AT&T buys into carrier

continued from page 2

partnered with Canada's dominant long-haul carrier, and AT&T has teamed with Canada's alternative provider. Unitel has only been offering switched services since October. Stentor owns close to 90% of the Canadian market for switched and private lines, according to a recent white paper from Boston-based market researcher The Yankee Group that predicts a market shakeout in Canada.

"AT&T was always viewed as a natural ally with Stentor, but Stentor shook things up by allying with MCI," said Mark Lowenstein, program manager for telecommunications at The Yankee Group. "This shows that carriers in other countries should not fool around with AT&T."

Iain Grant, managing director of The Yankee Group in Canada, said the potential losers could be Stentor and Sprint Corp. AT&T, which generates about $1 billion a year in revenue from Canadian traffic, will likely start moving traffic that terminates on Stentor's net to Unitel's. Sprint, which has worked closely with Unitel for years, could also be left looking for a new primary partner.

In a prepared statement, MCI said it "looks forward to full and fair competition in the entire North American market."

Unitel, which is jointly owned by Canadian Pacific, Ltd. and Rogers Communications, Inc., will gain access to AT&T services currently unavailable in Canada, AT&T marketing and operations expertise, and the research resources of AT&T Bell Laboratories. Unitel also plans to install AT&T switches and phase out Northern Telecom, Ltd. gear.

In mid-1993, Unitel and AT&T plan to start jointly marketing a host of services for companies doing business in the U.S. and Canada. The services will include virtual network, frame relay, digital private-line and teleconferencing offerings, among others.

George Harvey, Unitel's president and chief executive officer, said the deployment of new services without typical development expenses will enable Unitel to bring down costs faster than would have been possible otherwise.

According to Victor Pelson, president of AT&T's Communications Services Group, the AT&T-Unitel deal promises many benefits for AT&T's U.S.-based multinational companies, about 90% of which have locations in Canada and many of which are sure to take advantage of new trade opportunities with Canada. These benefits, which should start to kick in about midyear, will include one-stop shopping and a common set of services in the U.S. and Canada, he said.

Michael Sellitto, manager of telecommunications at Rich Products Corp., a frozen food manufacturer in Buffalo, N.Y., said he welcomes more cooperation between U.S. and Canadian carriers.

"With the free-trade agreement, we're doing more business than ever in Canada," he said. "Unfortunately, Canada hasn't experienced the benefits of competition like the U.S. in terms of lower prices and advanced technologies, but we'd like to see that happen."

Rob Rich, director and principal analyst for Dataquest, Inc.'s Worldwide Telecommunications Group in Framingham, Mass., said AT&T's investment in Unitel could be a harbinger of the future.

"With all of the privatizations and liberalizations going on with telephone companies around the world, I'd expect to see AT&T making similar agreements elsewhere," Rich said. ◘

MCI knocks down access cost

continued from page 1

With MCI's plan, discounts apply to channelized T-1 links used to access a range of services, including Vision, a low- to mid-range virtual net offering, and its high-end Virtual Network, 800 and Prism services, according to David Goodtree, senior manager of national accounts access marketing for MCI.

The T-1s can also be used to access services such as DS0, a 64K bit/sec offering, digital data service (DDS), voice-grade private lines, fractional T-1 and frame relay.

Under the plan, users receive a 5% discount on each dedicated access line for a one-year access contract, 10% for a two-year pact and 20% for a three-year access arrangement.

MCI also moved from a mileage-based scheme for determining the cost of an access link to a fixed-rate schedule. The carrier has substantially fewer points of presence (POP) in its network than AT&T and has decided to use a Numbering Plan Area (NPA)-NXX rate schedule to eliminate the mileage issue.

NPA is the area code from which a call is placed; NXX is the first three digits in a local phone number. With the new scheme, locations pay a fixed amount to reach their MCI POP, regardless of distance. AT&T stayed with the mileage-based approach.

Under the new plan, MCI said users that pay $550 a month per T-1 access line at both ends of a long-haul link can cut that cost by 20% to $440 a month by contracting for the service for three years, for instance. A one-year contract will lower the cost to $522.50 a month, a 5% savings.

AT&T's approach

Under AT&T's plan, users must first sign a Multi-Service Volume Pricing Plan (MSVPP), which covers the interoffice channel (IOC) segment of AT&T's private-line services, and commit to a minimum monthly spending level that can be less than or equal to the AMSVPP commitment. The minimum monthly IOC commitment helps determine the user's savings under the MSVPP.

A user that signs a five-year T-1 IOC contract with a $100,000 minimum monthly commitment could sign a five-year AMSVPP with the same commitment and receive a 10% discount on the T-1 used to reach the AT&T POP.

AMSVPP discounts apply to the carrier's fractional T-1 service, DDS, T-1 and T-3 offerings.

"We've been looking at a number of ways to reward customers for staying with AT&T," said Joe Lueckenhoff, product manager for AT&T's fractional T-1 and Dataphone Digital Service. "The access discount plan is only one example of this."

Analysts say the carriers' access marks the beginning of competition by carriers in a new arena. "The next frontier for competition by [interexchange carriers] is the local loop," said Mark Lowenstein, program manager for telecommunications at the The Yankee Group, a consulting and research firm in Boston.

"Users are paying far too much for dedicated access and are tired of having to deal with the huge disparity between the BOCs when it comes to pricing and provisioning," he said.

Sprint Corp. includes access discounts in the discount plan for each of its services.

Glenn Hall, director of access services for Sprint, said the carrier's access pricing is competitive with that of its competitors and added that the carrier can offer bulk service arrangements under which it further discounts dedicated access bought from local carriers. ◘

NETWORK WORLD

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(508) 875-6400

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As an AT&T 800 Service customer, you automatically get two remarkable features built into the service. With our new FASTAR℠ technology, in the event of a cable cut, we can get your calls to you in a matter of minutes, instead of several hours. To protect you against any other disruptions (including ones caused by your own equipment), you also get the AT&T 800 Service Assurance Policy.

Because every business has different needs, we offer a whole variety of optional features, too. Among other things, we have automatic routing features that direct calls to a specific location, department or individual, according to time of day, geography, call center capacity or purpose of call.

There's even one that lets you accommodate special promotion periods or call surges by creating up to six contingency routing plans. And if your call volume or staffing levels change a lot you can get a feature that lets you change the percentage of calls allocated to each of your locations just by making a simple call.

For the ultimate protection against network or equipment problems, you can opt for features that can reroute traffic within seconds to an alternate route or a prearranged alternate location.

As the inventors of 800 Service more than twenty-five years ago and the designers of 800 service innovations, AT&T has the expertise to create solutions for any business' needs. Including yours.

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Introducing
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Welcome to the LAN of plenty.

Now all that network computing was supposed to be, can be. Our new OS/2® LAN Server 3.0 has the functionality, flexibility and high performance to maximize all your network resources. So from individual departments to entire companies, it can make a difference all across the LAN.

Unlike a dedicated NOS, LAN Server 3.0 is built on top of OS/2. So you get the benefits of pre-emptive multitasking, enhanced OS/2 Crash Protection™ and the Workplace Shell™ GUI. Advanced and Entry versions both support the latest versions of OS/2, DOS and Windows™ on Token-Ring, Ethernet and IBM PC Network. There's support for Peer Services, optional support for Macintosh computers and TCP/IP, and you can connect more than 1,000 users on a single LAN.

Our Advanced version offers a new High Performance File System (HPFS) that decreases access time to the server's hard disk, improves security and offers fault-tolerant features like disk duplexing and disk mirroring. And LAN Server 3.0 goes beyond simple resource sharing with management enhancements that are systemwide. With sophisticated local and remote system management tools for installation, diagnostics and user security, your LAN will work more efficiently with less downtime. Plus LAN Server 3.0 provides an IBM migration path to OSF's emerging DCE standards.

For more information, call 1 800 3-IBM-OS2.* OS/2 LAN Server 3.0 does so much more than other network operating systems, it wins by a LANslide.

LAN Server 3.0 Advantages:

- Reduces Cost.
  - –Leadership performance.
  - –Dedicated hardware not required.
- Improves LAN administrator productivity.
  - –Graphical installation tool.
  - –Remote/unattended installation option.
  - –Support for remote administration.
- Reduces client server application development cost.
  - –Exploits power of OS/2 2.0.
  - –Common development platform at client and server.

For additional performance and/or functional information, call 1 800 3-IBM OS2.

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1 Industry: (check one only)

01. ☐ Manufacturers (other than Computer/Communications)
02. ☐ Finance/Banking
03. ☐ Insurance
04. ☐ Real Estate
05. ☐ Healthcare Services
06. ☐ Legal
07. ☐ Hospitality
08. ☐ Retail/Wholesale Trade/ Business Services
09. ☐ Transportation
10. ☐ Utilities
11. ☐ Education
12. ☐ Process Industries (Mining/Construction/ Petroleum Refining/Agriculture/Forestry)
13. ☐ Government, State/Local
14. ☐ Government, Federal
15. ☐ Military
16. ☐ Aerospace
17. ☐ Consultants (Independent)
18. ☐ Carriers
19. ☐ Interconnects
20. ☐ Manufacturers (Computer/Communications)
21. ☐ VAR/VAD/VAN/ Systems Houses
22. ☐ Distributors, Computer Related
23. ☐ Distributors, Communications Related
24. ☐ Other______________________

2 What is your job function? (check one only)

NETWORKING MANAGEMENT

1. ☐ Networking Mgmt. 2. ☐ LAN Mgmt.
3. ☐ Datacom/Telecom Mgmt. 4. ☐ Engineering Mgmt.

MIS MANAGEMENT

5. ☐ MIS, IS, IT Mgmt. 6. ☐ Engineering Mgmt.

CORPORATE MANAGEMENT

7. ☐ Corporate Mgmt. (CIO, CEO, Pres., VP, Dir., Mgr., Fin. Mgmt.)
8. ☐ Consultant (Independent)
9. ☐ Other______________________

3 My responsibilities include: (check only one)

1. ☐ LANs/ Internetworking/ WANs
2. ☐ LANs/ Internetworking 3. ☐ LANs
4. ☐ WANs 5. ☐ None

4 What is the total number of sites for which you have purchasing influence? (check one only)

1. ☐ 100+ 2. ☐ 50–99 3. ☐ 20–49
4. ☐ 10–19 5. ☐ 2–9 6. ☐ 1
7. ☐ None

5 What is your scope and involvement in purchasing decisions for network products & services for your enterprise?

A. Scope (check one only)	**B.** Involvement (check all that apply)
1. ☐ Corporatewide	1. ☐ Recommend/ Specify
2. ☐ Multienterprise (consultants)	2. ☐ Approve
3. ☐ Departmental	3. ☐ Evaluate

4. ☐ None (A or B)

Check all that apply in columns A and B:

I am involved in the purchase of the following products/services.

I plan to purchase the following products/ services in the next year.

olved Plan to

B LOCAL-AREA NETWORKS

01. ☐ Local-Area Networks
02. ☐ LAN Servers
03. ☐ LAN Operating Systems Software
04. ☐ Superservers
05. ☐ Data Base Servers (Oracle, Sybase, etc).
06. ☐ Terminal Servers
07. ☐ LAN Services
08. ☐ LAN Storage Devices (optical, tape, disk, etc,. including backup systems)
09. ☐ Network Test Equipment
10. ☐ Hubs

☐ 11. ☐ Cables, Connectors, Baluns
☐ 12. ☐ UPS
☐ 13. ☐ Network Adapter Boards
☐ 14. ☐ Peer-to-Peer LANs
☐ 15. ☐ Wireless LANs
☐ 16. ☐ SNMP Network Management
☐ 17. ☐ ATM (Asynchronous Transfer Mode)

A B INTERNETWORKING

☐ 18. ☐ Bridges
☐ 19. ☐ Routers
☐ 20. ☐ Gateways
☐ 21. ☐ Bridge/Routers
☐ 22. ☐ Hubs
☐ 23. ☐ Intelligent Hubs
☐ 24. ☐ Communications Servers

A B COMPUTERS/PERIPHERALS

☐ 25. ☐ Micros/PCs
☐ 26. ☐ Minis
☐ 27. ☐ Mainframes
☐ 28. ☐ Pen-Based
☐ 29. ☐ Laptops
☐ 30. ☐ Workstations
☐ 31. ☐ Image Processing Workstations
☐ 32. ☐ Front-End Processors
☐ 33. ☐ Terminals
☐ 34. ☐ Printers
☐ 35. ☐ Cluster Controllers
☐ 36. ☐ Fax Machines
☐ 37. ☐ X-Terminals

A B SOFTWARE/APPLICATIONS

☐ 38. ☐ Network Management
☐ 39. ☐ Micro to Mainframe
☐ 40. ☐ Security
☐ 41. ☐ Communication/Terminal Emulation
☐ 42. ☐ Word Processing
☐ 43. ☐ Operating Systems
☐ 44. ☐ Business Applications (Finance/Mfg/HR)
☐ 45. ☐ Applications Development
☐ 46. ☐ Data Base Management
☐ 47. ☐ Spreadsheet
☐ 48. ☐ Groupware
☐ 49. ☐ EDI
☐ 50. ☐ E-Mail
☐ 51. ☐ Windows/Graphical User Interface
☐ 52. ☐ 4GL/Development
☐ 53. ☐ Multimedia
☐ 54. ☐ Graphics
☐ 55. ☐ Utilities

A B WIDE-AREA NETWORK EQUIP./SERVICES

☐ 56. ☐ Modems (9.6K bps and over)
☐ 57. ☐ Modems (under 9.6K bps)
☐ 58. ☐ T-1
☐ 59. ☐ T-3
☐ 60. ☐ Fractional T-1
☐ 61. ☐ Data Switches
☐ 62. ☐ SMDS
☐ 63. ☐ ATM (Asynchronous Transfer Mode)
☐ 64. ☐ Matrix Switches
☐ 65. ☐ Packet Switches
☐ 66. ☐ Protocol Converters
☐ 67. ☐ Diagnostic/Test Equipment
☐ 68. ☐ DSU/CSUs
☐ 69. ☐ Microwave
☐ 70. ☐ Fax Boards/Modems
☐ 71. ☐ VSAT
☐ 72. ☐ Fiber Optic
☐ 73. ☐ Satellite
☐ 74. ☐ ISDN
☐ 75. ☐ PBXs (over 1000 lines)
☐ 76. ☐ PBXs (under 1000 lines)
☐ 77. ☐ Automatic Call Distributors
☐ 78. ☐ Voice Messaging Systems
☐ 79. ☐ Videoconferencing Systems
☐ 80. ☐ Voice Response/ Processing
☐ 81. ☐ Switched Voice
☐ 82. ☐ Dedicated Leased Line
☐ 83. ☐ Switched Data
☐ 84. ☐ Centrex
☐ 85. ☐ E-Mail/On-Line Information
☐ 86. ☐ Image Processing
☐ 87. ☐ Audio Teleconferencing
☐ 88. ☐ Local Services
☐ 89. ☐ WATS MTs
☐ 90. ☐ International
☐ 91. ☐ Virtual Networks
☐ 92. ☐ Frame Relay
☐ 93. ☐ Value Added Services
☐ XX ☐ None of the above (1–93)

1 FOLD HERE

What is the total number of A: LANs B: Workstations/Nodes in your entire organization?

Lans A		Workstations/ Nodes B
☐	5,000+	☐
☐	1,000–4,999	☐
☐	100–999	☐
☐	50–99	☐
☐	10–49	☐
☐	9 or Less	☐

Which of the following network platforms are currently installed/ planned in the next year?

ETWORK ARCHITECTURES

esent Planned

01. ☐ SNA
02. ☐ Decnet
03. ☐ Map/Top
04. ☐ TCP/IP
05. ☐ DCA (Unisys)
06. ☐ X.25
07. ☐ Novell IPX/SPX
08. ☐ APPC/APPN/LU 6.2
09. ☐ Netbios
10. ☐ OSI
11. ☐ Appletalk
12. ☐ Other ______________________

LAN OPERATING SYSTEM

☐ 13. ☐ Localtalk (Appletalk)
☐ 14. ☐ Banyan (Vines)
☐ 15. ☐ DCA (Irmalan)
☐ 16. ☐ DCA (10-Net)
☐ 17. ☐ IBM (Lan Server)
☐ 18. ☐ IBM (PC Lan Program)
☐ 19. ☐ Microsoft (Lan Manager)
☐ 20. ☐ Ungermann-Bass (Net/1)
☐ 21. ☐ Novell (Netware, 2.X, 3.X, 4.X)
☐ 22. ☐ Proteon (Pronet)
☐ 23. ☐ Sitka (TOPS)
☐ 24. ☐ 3COM (3+, 3+Open)
☐ 25. ☐ Artisoft (Lantastic)
☐ 26. ☐ Hayes (Lanstep)
☐ 27. ☐ Dec (Pathworks)
☐ 28. ☐ Other ______________________

LAN ENVIRONMENT

☐ 29. ☐ 4M Token Ring
☐ 30. ☐ 16M Token Ring
☐ 31. ☐ Arcnet

☐ 32. ☐ Ethernet
☐ 33. ☐ Starlan
☐ 34. ☐ FDDI
☐ 35. ☐ Localtalk
☐ 36. ☐ 10Base-T
☐ 37. ☐ Other ______________________

OPERATING SYSTEM

☐ 38. ☐ DOS
☐ 39. ☐ Unix/Xenix/Aix
☐ 40. ☐ OS/2
☐ 41. ☐ OS/2 2.X
☐ 42. ☐ MVS
☐ 43. ☐ VM
☐ 44. ☐ VMS
☐ 45. ☐ Macintosh
☐ 46. ☐ Windows
N/A 47. ☐ Windows Nt
☐ 48. ☐ X Windows
☐ 49. ☐ Other ______________________

9 For which areas outside of the U.S. do you have purchase influence? (check all that apply)

1. ☐ Europe 4. ☐ Australia
2. ☐ Asia 5. ☐ Middle East
3. ☐ South America 6. ☐ None

10 Which of the following hardware platforms is installed/ planned in your company? (Check all that apply)

	Mainframes Currently Installed	Planned Next Year	Minis Currently Installed	Planned Next Year
01. Dec	☐	☐	☐	☐
02. IBM	☐	☐	☐	☐
03. Amdahl	☐	☐	☐	☐
04. AT&T	☐	☐	☐	☐
05. Bull HNIS	☐	☐	☐	☐
06. Data General	☐	☐	☐	☐
07. HP	☐	☐	☐	☐
08. Tandem	☐	☐	☐	☐
09. Unisys	☐	☐	☐	☐
10. Other__________	☐	☐	☐	☐

MICROCOMPUTERS (Please Use Numbers Only)	Number Installed	Number Planned Next Year
11. Macintosh 20, 30, 40		
12. Macintosh Other		
13. PCs based on 80586	N/A	
14. PCs based on 80486		
15. PCs based on 80386		
16. PCs based on 80286		
17. PCs based on 8086/8088		
18. RISC/Unix based wkstns		
19. Other		

11 Estimated value of networking equipment and services:

A. Which you helped specify, recommended or approved in the last year?
B. Which you plan to help specify, recommend or approve in the next year?

A		B	
☐	1.	☐	$100 million and over
☐	2.	☐	$50–$99.9 million
☐	3.	☐	$25–$49.9 million
☐	4.	☐	$20–$24.9 million
☐	5.	☐	$10–$19.9 million
☐	6.	☐	$5–$9.9 million
☐	7.	☐	$1–$4.9 million
☐	8.	☐	$500,000–$999,999
☐	9.	☐	$499,999 or less

12 Estimated gross annual revenue of your entire company/ institution: (check one only)

1. ☐ Over $10 billion 2. ☐ $1–$9.9 billion
3. ☐ $500–$999.9 million 4. ☐ $100–$499.9 million
5. ☐ $50–$99.9 million 6. ☐ $10–$49.9 million
7. ☐ $5–$9.9 million 8. ☐ $4.9 million or less

13 Estimated number of employees for your entire organization

1. ☐ Over 10,000 2. ☐ 5,000–9,999
3. ☐ 2,500–4,999 4. ☐ 1,000–2,499
5. ☐ 500–999 6. ☐ 499 or less

2 FOLD HERE

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Company Name
Company Address
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LAN Server 3.0

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02. ☐ Finance/Banking
03. ☐ Insurance
04. ☐ Real Estate
05. ☐ Healthcare Services
06. ☐ Legal
07. ☐ Hospitality
08. ☐ Retail/Wholesale Trade/ Business Services
09. ☐ Transportation
10. ☐ Utilities
11. ☐ Education
12. ☐ Process Industries (Mining/Construction/ Petroleum Refining/Agriculture/Forestry)
13. ☐ Government, State/Local
14. ☐ Government, Federal
15. ☐ Military
16. ☐ Aerospace
17. ☐ Consultants (Independent)
18. ☐ Carriers
19. ☐ Interconnects
20. ☐ Manufacturers (Computer/Communications)
21. ☐ VAR/VAD/VAN/ Systems Houses
22. ☐ Distributors, Computer Related
23. ☐ Distributors, Communications Related
24. ☐ Other________________

2 What is your job function? (check one only)

NETWORKING MANAGEMENT
1. ☐ Networking Management
2. ☐ LAN Management
3. ☐ Datacom/Telecom Management
4. ☐ Engineering Management

MIS MANAGEMENT
5. ☐ MIS, IS, IT Management
6. ☐ Engineering Management

CORPORATE MANAGEMENT
7. ☐ Corporate Mgmt. (CIO, CEO, Pres., VP, Dir., Mgr., Fin. Management)
8. ☐ Consultant (Independent)
9. ☐ Other________________

3 My responsibilities include: (check only one)

1. ☐ LANs/ Internetworking/ WANs
2. ☐ LANs/ Internetworking 3. ☐ LANs
4. ☐ WANs 5. ☐ None

4 What is the total number of sites for which you have purchasing influence? (check one only)

1. ☐ 100+ 2. ☐ 50–99 3. ☐ 20–49
4. ☐ 10–19 5. ☐ 2–9 6. ☐ 1
7. ☐ None

5 What is your scope and involvement in purchasing decisions for network products & services for your enterprise?

A. Scope (check one only)
1. ☐ Corporatewide
2. ☐ Multienterprise (consultants)
3. ☐ Departmental

B. Involvement (check all that apply)
1. ☐ Recommend/ Specify
2. ☐ Approve
3. ☐ Evaluate
4. ☐ None (A or B)

6 Check all that apply in columns A and B:

A. I am involved in the purchase of the following products/services.

B. I plan to purchase the following products/ services in the next year.

Involved Plan to Purchase

A B LOCAL-AREA NETWORKS
☐ 01. ☐ Local-Area Networks
☐ 02. ☐ LAN Servers
☐ 03. ☐ LAN Operating Systems Software
☐ 04. ☐ Superservers
☐ 05. ☐ Data Base Servers (Oracle, Sybase, etc).
☐ 06. ☐ Terminal Servers
☐ 07. ☐ LAN Services
☐ 08. ☐ LAN Storage Devices (optical, tape, disk, etc,. including backup systems)
☐ 09. ☐ Network Test Equipment
☐ 10. ☐ Hubs
☐ 11. ☐ Cables, Connectors, Baluns
☐ 12. ☐ UPS
☐ 13. ☐ Network Adapter Boards
☐ 14. ☐ Peer-to-Peer LANs
☐ 15. ☐ Wireless LANs
☐ 16. ☐ SNMP Network Management
☐ 17. ☐ ATM (Asynchronous Transfer Mode)

A B INTERNETWORKING
☐ 18. ☐ Bridges
☐ 19. ☐ Routers
☐ 20. ☐ Gateways
☐ 21. ☐ Bridge/Routers
☐ 22. ☐ Hubs
☐ 23. ☐ Intelligent Hubs
☐ 24. ☐ Communications Servers

A B COMPUTERS/PERIPHERALS
☐ 25. ☐ Micros/PCs
☐ 26. ☐ Minis
☐ 27. ☐ Mainframes
☐ 28. ☐ Pen-Based
☐ 29. ☐ Laptops
☐ 30. ☐ Workstations
☐ 31. ☐ Image Processing Workstations
☐ 32. ☐ Front-End Processors
☐ 33. ☐ Terminals
☐ 34. ☐ Printers
☐ 35. ☐ Cluster Controllers
☐ 36. ☐ Fax Machines
☐ 37. ☐ X-Terminals

A B SOFTWARE/APPLICATIONS
☐ 38. ☐ Network Management
☐ 39. ☐ Micro to Mainframe
☐ 40. ☐ Security
☐ 41. ☐ Communication/Terminal Emulation
☐ 42. ☐ Word Processing
☐ 43. ☐ Operating Systems
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☐ 46. ☐ Data Base Management
☐ 47. ☐ Spreadsheet
☐ 48. ☐ Groupware
☐ 49. ☐ EDI
☐ 50. ☐ E-Mail
☐ 51. ☐ Windows/Graphical User Interface
☐ 52. ☐ 4GL/Development
☐ 53. ☐ Multimedia
☐ 54. ☐ Graphics
☐ 55. ☐ Utilities

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☐ 57. ☐ Modems (under 9.6K bps)
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☐ 59. ☐ T-3
☐ 60. ☐ Fractional T-1
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☐ 70. ☐ Fax Boards/Modems
☐ 71. ☐ VSAT
☐ 72. ☐ Fiber Optic
☐ 73. ☐ Satellite
☐ 74. ☐ ISDN
☐ 75. ☐ PBXs (over 1000 lines)
☐ 76. ☐ PBXs (under 1000 lines)
☐ 77. ☐ Automatic Call Distributors
☐ 78. ☐ Voice Messaging Systems
☐ 79. ☐ Videoconferencing Systems
☐ 80. ☐ Voice Response/ Processing
☐ 81. ☐ Switched Voice
☐ 82. ☐ Dedicated Leased Line
☐ 83. ☐ Switched Data
☐ 84. ☐ Centrex
☐ 85. ☐ E-Mail/On-Line Information
☐ 86. ☐ Image Processing
☐ 87. ☐ Audio Teleconferencing
☐ 88. ☐ Local Services
☐ 89. ☐ WATS MTs
☐ 90. ☐ International
☐ 91. ☐ Virtual Networks
☐ 92. ☐ Frame Relay
☐ 93. ☐ Value Added Services
☐ XX ☐ None of the above (1–93)

7 What is the total number of A: LANs B: Workstations/Nodes in your entire organization?

	Lans A		Workstations/ Nodes B
1.	☐	5,000+	☐
2.	☐	1,000–4,999	☐
3.	☐	100–999	☐
4.	☐	50–99	☐
5.	☐	10–49	☐
6.	☐	9 or Less	☐

8 Which of the following network platforms are currently installed/ planned in the next year?

NETWORK ARCHITECTURES

Present Planned
☐ 01. ☐ SNA
☐ 02. ☐ Decnet
☐ 03. ☐ Map/Top
☐ 04. ☐ TCP/IP
☐ 05. ☐ DCA (Unisys)
☐ 06. ☐ X.25
☐ 07. ☐ Novell IPX/SPX
☐ 08. ☐ APPC/APPN/LU 6.2
☐ 09. ☐ Netbios
☐ 10. ☐ OSI
☐ 11. ☐ Appletalk
☐ 12. ☐ Other ________________

LAN OPERATING SYSTEM
☐ 13. ☐ Localtalk (Appletalk)
☐ 14. ☐ Banyan (Vines)
☐ 15. ☐ DCA (Irmalan)
☐ 16. ☐ DCA (10-Net)
☐ 17. ☐ IBM (Lan Server)
☐ 18. ☐ IBM (PC Lan Program)
☐ 19. ☐ Microsoft (Lan Manager)
☐ 20. ☐ Ungermann-Bass (Net/1)
☐ 21. ☐ Novell (Netware, 2.X, 3.X, 4.X)
☐ 22. ☐ Proteon (Pronet)
☐ 23. ☐ Sitka (TOPS)
☐ 24. ☐ 3COM (3+, 3+Open)
☐ 25. ☐ Artisoft (Lantastic)
☐ 26. ☐ Hayes (Lanstep)
☐ 27. ☐ Dec (Pathworks)
☐ 28. ☐ Other ________________

LAN ENVIRONMENT
☐ 29. ☐ 4M Token Ring
☐ 30. ☐ 16M Token Ring
☐ 31. ☐ Arcnet
☐ 32. ☐ Ethernet
☐ 33. ☐ Starlan
☐ 34. ☐ FDDI
☐ 35. ☐ Localtalk
☐ 36. ☐ 10Base-T
☐ 37. ☐ Other ________________

OPERATING SYSTEM
☐ 38. ☐ DOS
☐ 39. ☐ Unix/Xenix/Aix
☐ 40. ☐ OS/2
☐ 41. ☐ OS/2 2.X
☐ 42. ☐ MVS
☐ 43. ☐ VM
☐ 44. ☐ VMS
☐ 45. ☐ Macintosh
☐ 46. ☐ Windows
N/A 47. ☐ Windows Nt
☐ 48. ☐ X Windows
☐ 49. ☐ Other ________________

10 Which of the following hardware platforms is installed/ planned in your company? (Check all that apply)

	Mainframes Currently Installed	Planned Next Year	Minis Currently Installed	Planned Next Year
01. Dec	☐	☐	☐	☐
02. IBM	☐	☐	☐	☐
03. Amdahl	☐	☐	☐	☐
04. AT&T	☐	☐	☐	☐
05. Bull HNIS	☐	☐	☐	☐
06. Data General	☐	☐	☐	☐
07. HP	☐	☐	☐	☐
08. Tandem	☐	☐	☐	☐
09. Unisys	☐	☐	☐	☐
10. Other________	☐	☐	☐	☐

MICROCOMPUTERS (Please Use Numbers Only)	Number Installed	Number Planned Next Year
11. Macintosh 20, 30, 40		
12. Macintosh Other		
13. PCs based on 80586	N/A	
14. PCs based on 80486		
15. PCs based on 80386		
16. PCs based on 80286		
17. PCs based on 8086/8088		
18. RISC/Unix based wkstns		
19. Other		

9 For which areas outside of the U.S. do you have purchase influence? (check all that apply)

1. ☐ Europe 4. ☐ Australia
2. ☐ Asia 5. ☐ Middle East
3. ☐ South America 6. ☐ None

11 Estimated value of networking equipment and services:

A. Which you helped specify, recommended or approved in the last year?

B. Which you plan to help specify, recommend or approve in the next year?

A		B	
☐	1.	☐	$100 million and over
☐	2.	☐	$50–$99.9 million
☐	3.	☐	$25–$49.9 million
☐	4.	☐	$20–$24.9 million
☐	5.	☐	$10–$19.9 million
☐	6.	☐	$5–$9.9 million
☐	7.	☐	$1–$4.9 million
☐	8.	☐	$500,000–$999,999
☐	9.	☐	$499,999 or less

12 Estimated gross annual revenue of your entire company/ institution: (check one only)

1. ☐ Over $10 billion
2. ☐ $1–$9.9 billion
3. ☐ $500–$999.9 million
4. ☐ $100–$499.9 million
5. ☐ $50–$99.9 million
6. ☐ $10–$49.9 million
7. ☐ $5–$9.9 million
8. ☐ $4.9 million or less

13 Estimated number of employees for your entire organization

1. ☐ Over 10,000
2. ☐ 5,000–9,999
3. ☐ 2,500–4,999
4. ☐ 1,000–2,499
5. ☐ 500–999
6. ☐ 499 or less

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